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The Province of Alberta

IN THE MATTER OF "THE NATURAL
GAS UTILITIES ACT"

—and—

IN THE MATTER OF an Enquiry into
Scheme to be adopted for Gathering,
Processing and Transmission of
Natural Gas in Turner Valley

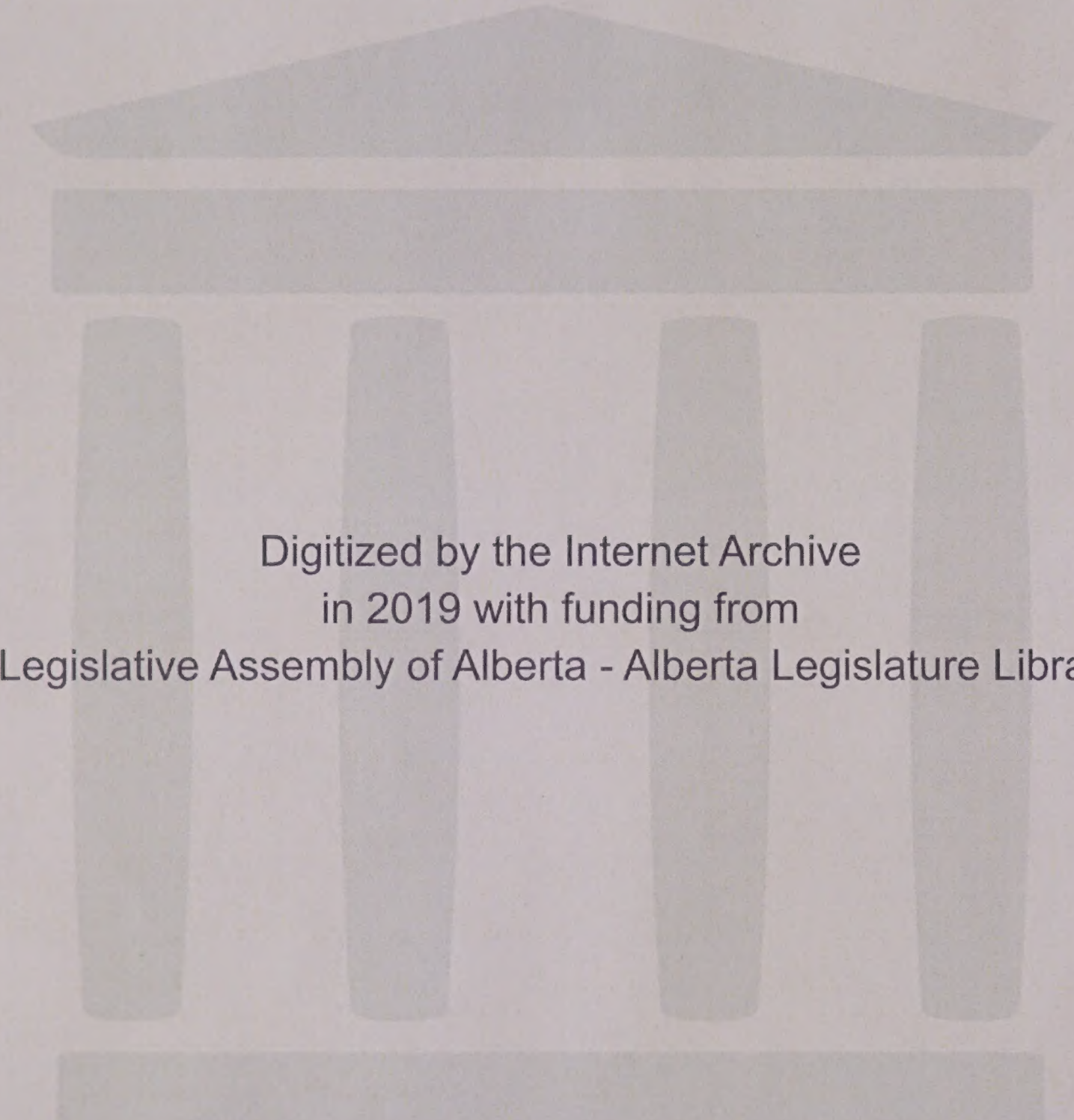
G. M. BLACKSTOCK, Esq., K.C., *Chairman*

Dr. E. H. BOOMER, F.C.I.C., *Commissioner*

Session:

CALGARY, Alberta April 3rd, 1945.

VOLUME 17



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I N D E X

VOLUME 17

April 3rd, 1945.

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Corrections

9.30 a.m.
April 3/45.

-1325-

MR. FENERTY: There is a matter I might mention to the Board, before the Hearing resumes, if it is in order. I spoke to you, Mr. Chairman, the other afternoon about it, a situation which had come up when I learned that Mr. Morrison was leaving, had to leave Calgary on the night of the 18th to be present at Ottawa at the Cooperative Commission Hearing. Mr. Steer advises me he also has to be there for the following week of that Session and I have spoken to the other Counsel about the situation and they suggest that perhaps we should discuss it now so that everybody will know in advance what is going to be done. Now as I understand the situation on the week of the 16th we are going to have the British American valuation and then it is proposed following that to call Mr. Hamilton and following his evidence Mr. Morrison. Now that would bring us squarely to that following week. As I understand Mr. Sterr might be able to make some arrangement for someone to attend in his place but I am in a difficult position that the evidence of Mr. Hamilton, followed by Mr. Morrison, I just have to have Mr. Morrison here while Mr. Hamilton's submissions are read. Now at that time I thought it would possibly be only one week but Mr. Steer tells me that he thinks it will take several weeks.

MR. STEER: The Cooperative Commission will not be finished within two weeks.

THE CHAIRMAN: I think, Mr. Fenerty, that perhaps Counsel and the Board should have a meeting this afternoon and we can discuss these things freely.

MR. FENERTY: The reason I mentioned it now was some Counsel suggested we should know now so that we can make our arrangements.

Corrections

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THE CHAIRMAN: I think it would be better to meet and discuss it informally after this Session is over.

MR. FENERTY: Very well.

MR. JOHNSON: Mr. Chairman, I have some corrections in Volume 14 that I would like to draw to your attention.

On the 14th line of page 1078, the last word of that line is "lateral" and it should read "latter".

In the fifth line from the bottom of the same page, in the middle of the line, the word "and", the words following that word down to including the last word of the sentence perhaps should be out and the sentence should read "And it is not an estimate of the gas I expect will be produced".

Page 1079, the second line from the top, the second last word now reads "wills" and it should be "wells".

And the 18th line of the same page, the word "Royalite" should read "Royal", the reference being to "Royal Canadian No. I".

Page 1081, the third line, the last word now reads "average" and should read "operating".

Page 1084, in the seventh line from the bottom, the line now reads: "Allow a well to abandon". It should be "Allow a well to be abandoned".

Page 1086, the last line after the word "all", I had better read the sentence as it is. It now reads "that would be all this southerly legal subdivision", and it should read "that should be all except the Southern legal subdivisions".

Page 1089, in the eighth line, that is

CONFIDENTIAL

SECRET

TO: DIRECTOR, FBI

FROM: SAC, NEW YORK (100-100000)

SUBJECT: [Illegible]

RE: [Illegible]

On 10/1/50, [Illegible]

at 10:15 AM, [Illegible]

on the 10th floor of [Illegible]

with [Illegible]

to the [Illegible]

some [Illegible]

investigation [Illegible]

the [Illegible]

and [Illegible]

the [Illegible]

the [Illegible]

the [Illegible]

the [Illegible]

the [Illegible]

the [Illegible]

the [Illegible]

the [Illegible]

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the [Illegible]

Corrections

-1327-

the last line of the first paragraph, after the words "24 hour", there should be the word "shutin".

Page 1090, the third line from the bottom, the last word should be "decreasing" and not "increasing".

Page 1091, the second line of that page, the third word should be "closer" not "close".

And on the same page, page 1091, the 21st line, after the words "Royelite gas cap area" add the words "was concerned".

Page 1092, the 20th line, the last two words of the line read "deep wells", that should be "Deep Oils No.I". It is a reference to a well of that name.

Page 1092A , the 4th line, instead of the words "built-up" it should be "build-up".

And in the 14th line of the same page, the line begins "if it was" and it should be "if it has required".

Page 1093, the first line should commence "There might be", instead of the words now appearing "might use".

And in the third line after the word "Because", there should be the words: "There is an area" instead of the words "those areas are".

And then the fourth and fifth lines should be out and the following words should appear: "the gas cap and the crude oil area west of Royelite District #1 gas cap where there is an impermeable zone."

Then the eleventh line of the same page after "Pacific Pete" add "7".

Then the seventeenth line of the same page,

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

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• "Close" and "Close" in "Close" and "Close"

• • •

Corrections

-1328-

the first word of the line now reads "variable", and it should be "very low".

Also on the same page, the third line from the bottom, the word "approximately" should read "permeability".

Then page 1094, the second line, after the word "there" add the words, perhaps I should read it, "if there would be very much".

And in the third line after the word "be" add the word "much". "would be much in the reverse direction".

Then in the tenth line, the first word of the line now reads "in Royalite", and it should be "around Royalite".

Page 1096, the 9th line, being the second line of the paragraph, after the words "and had", add the words "an initial closed pressure".

And in the 4th line from the bottom of the same page, the word "datum" should read "data".

Page 1101, the 5th line, after "Royalite district" add "No.I", so that it will read "Royalite District No.I".

The next page, page 1102, the 6th line from the bottom, the sentence now reads "that is graphs 6 and 75", and it should read "that is graphs 11 to 75".

Page 1106 in the first line "this is for testing" should be "this is for adjusting". "Adjusting" instead of "testing".

(Go to page 1329)

Corrections

- 1329 -

Page 1107, 13th line, after the word "those" add "with the".

Page 1111, 5th line from the bottom. After the word "pressures" add "versus", so that it will read, "pressures versus accumulated production"; and in the next line after the word "and" eliminate the word "in" and substitute the word "knowing".

Page 1112, in the 8th line the word "two" should read "time".

Page 1113, 2nd line, the last word being "the" should read "when". 10th line instead of 90% it should read "90 million".

In the 5th line from the bottom of the same page, the answer reads "Well we will" and it should commence "Why do you".

Page 1118, in the 14th line, "Table VI" should read "Page 6". In the very last line instead of "1944" there should be the words, "the future".

Page 1119, the first word of the last line, instead of "do" should be "I".

Page 1123. I will have to pass by that one for the moment and ask Mr. Connell what is meant there.

Page 1124, Line 9, the last word is "power" and it should be "longer".

Page 1125, 14th line, there is a question by Dr. Boomer and the question reads as follows, "At 300 tubing pressure and 200 pounds bottom hole pressure". Mr. Connell wonders if the pressures referred to by the Commissioner are those intended.

DR. BOOMER: I will have to correct that myself.

MR. JOHNSON: In the 20th line of the same page, the last word of the sentence is "end". It should be "annulus".

The second last line of the same page the figure "19" should be "95".

Page 1127, the 6th line. The type of pump referred to is a "surge" pump and not a "search" pump.

Page 1128, 7th line from the bottom, the line now reads "We are making an attempt to reduce the suction". It should be "We will make an attempt after reducing the suction".

Two lines lower down on the same page the sentence commencing "To increase the" it

Corrections.

H. Le M. Stevens-Guille,
Re-Exam. by Mr. Chambers.

- 1330 -

should commence, "If the increase in". The first line on Page 1130, the word "I" should read "You". The 9th line, the word "use" should read "lose", and in the next line the word "until" should read "unless". Page 1131, in the 15th line after the words "gathering line" the words ^{"to it"} / should be eliminated and it should read "blew up and". At page 1138, 10th line, after the first word which is "two", insert the word "estimated", and in the 14th line, the word "uneconomic" should read "economic". At page 1141, 5th line from the bottom, the word "declined" should read "increased" and on page 1146, in the 5th line, after the words "per square inch" insert the word "higher".

THE CHAIRMAN: What line is that?

MR. JOHNSON: The 5th line from the top of the page after the words "per square inch" add the word "higher". And in the next line, the first word being "at" should read "to". I have given the Court Reporters a copy.

MR. CHAMBERS: If the Board pleases, I would like to call Mr. Stevens-Guille on a matter that arose some days ago.

H. Le M. STEVENS-GUILLE, previously sworn,
recalled by Mr. Chambers.

Q I am calling Mr. Stevens-Guille in connection with a matter that arose during the evidence of Mr. Ralph Davis at Pages 937 to 940 of the transcript, which was a discussion about the amount of compressor capacity that would have been required to have been installed seven or eight years ago as compared with -

MR. BLANCHARD: What volume is that?

MR. CHAMBERS: Volume 12 - as compared with what is being installed now. Mr. Stevens-Guille, you have prepared, as I understand it, a statement of the crude gas production back in September 1938?

A That is correct sir.

H. Le M. Stevens-Guille,
Re-Exam. by Mr. Chambers.

- 1331 -

Q Where did you get the information that you have put in that statement?

A The data was obtained from the Conservation Board records.

Q I would like to tender that as an Exhibit.

STATEMENT REFERRED TO NOW MARKED AS
EXHIBIT 53.

Would you please explain to the Board just what this statement Exhibit 53 is supposed to be.

A It is the total for each day for September 1938 of the crude oil gas produced in Turner Valley shown under two headings. In the first column those with a gas-oil ratio under 31 thousand cubic feet per barrel, and in a second column those with a ratio over 31 thousand cubic feet per barrel and in a third column the columns one and two are totalled. And the total of column one on a daily average basis is 108,299,000 cubic feet, and column two, 35,685,000 and column three the totals of columns one and two, 143,984,000 cubic feet are shown to have been produced on a daily average basis during September 1938.

Q Now Mr. Stevens-Guille I would like to put this question to you. If at that time, I understand at that time the extension at the north end of the field was not known. Is that right?

A That is correct.

Q At that time would it cost more or less to instal the compressor capacity than it would cost at the present time. What have you to say to that?

A It would have cost more to instal the necessary compressor capacity to handle the quantity of gas shown by the Conservation Board records to the total of these figures that I have just given.

THE CHAIRMAN: And of course you would have had much more gas to write off that additional cost?

A That is true. The compressors would have ultimately put



H-1-1

H. LeM. Stevens-Guille,
Cross-Exam. by Mr. Fenerty.

- 1332 -

through more gas.
Q *Cross-Ex. by Mr. Fenerty* Mr. Stevens-Guille, at that time, of course, the Brown Plan was not in effect?

A In 1938, no.

Q And this was a more or less unrestricted flow, was it?

A I think I am correct in saying that at that time the method of proration was to meet the crude oil requirements of the market.

Q And any restriction of the flow was due to the individual ideas of the operators?

A No, I think not. I think at that time the wells were given a prorated flow based on a formula worked out and with the ultimate total controlled by the market requirements of the crude oil. I am not positive that I am correct, that that was in September, 1938, speaking from memory.

Q Did they prorate all the wells?

A That is right.

Q MR. CHAMBERS: Was it not, Mr. Stevens-Guille, at that time that the Allen or the Knode Plan was brought into effect?

A I think the proration was under the Knode formula.

Q THE CHAIRMAN: Would it be possible to work out the cost of additional, the additional cost of those compressors in 1938 and using the unit method of depreciation, tell us what the position would be today with reference to the expenditure made in 1938?

A It would be possible to do it, sir.

Q A long job, Mr. Stevens-Guille?

A Quite a long job.

Q You see the importance of it, arising out of your own exhibit 53? I do not think I will ask you to do it.

MR. CHAMBERS: As a matter of fact the only

H. LeM. Stevens-Guille,
Cr.Ex. by Mr. Fenerty.

- 1333 -

reason I tendered it was that there was a suggestion of Mr. Davies that my figures that I put to him were away out.

A Of course, in making an estimate in 1938 about what compressor capacity you would require you would not have the information that you have got today.

Q THE CHAIRMAN: That is true, and you would still have your compressor problems to meet at that time, perhaps worse than you have today.

A A very large problem.

Q Still it is a factor. Have you any questions, Mr. Harvie?

MR. HARVIE: No sir.

THE CHAIRMAN: Any, Mr. McDonald?

MR. McDONALD: No sir.

THE CHAIRMAN: That is all, Mr. Stevens-Guille, thanks.

The next issue to be discussed is
The Present and Estimated Future Market Demand.

MR. BLANCHARD: Mr. Chairman, I was wondering whether, before we proceed with that next chapter of the Agenda, whether the Canadian Western Gas Company desired now to put in their peak load figures, because it belongs to the last phase. Mr. Steer has furnished me with an estimate of daily peak loads and I wondered whether he was prepared yet to put his official in the box in connection with that so that we can close that chapter. That is all I was thinking about.

MR. CHAMBERS: Would that not properly come under the market demands?

THE CHAIRMAN: Of course the two are related.

1. The first part of the report discusses the background of the project and the objectives of the study.

2. The second part of the report describes the methodology used in the study.

3. The third part of the report presents the results of the study and discusses the implications of the findings.

4. The fourth part of the report concludes the study and provides recommendations for future research.

5. The fifth part of the report provides a summary of the study.

6. The sixth part of the report discusses the limitations of the study and the strengths of the findings.

7. The seventh part of the report provides a conclusion and a final summary of the study.

8. The eighth part of the report provides a list of references and a bibliography.

9. The ninth part of the report provides a list of appendices and a list of figures.

10. The tenth part of the report provides a list of tables and a list of figures.

11. The eleventh part of the report provides a list of tables and a list of figures.

12. The twelfth part of the report provides a list of tables and a list of figures.

13. The thirteenth part of the report provides a list of tables and a list of figures.

14. The fourteenth part of the report provides a list of tables and a list of figures.

15. The fifteenth part of the report provides a list of tables and a list of figures.

16. The sixteenth part of the report provides a list of tables and a list of figures.

17. The seventeenth part of the report provides a list of tables and a list of figures.

18. The eighteenth part of the report provides a list of tables and a list of figures.

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23. The twenty-third part of the report provides a list of tables and a list of figures.

24. The twenty-fourth part of the report provides a list of tables and a list of figures.

25. The twenty-fifth part of the report provides a list of tables and a list of figures.

26. The twenty-sixth part of the report provides a list of tables and a list of figures.

27. The twenty-seventh part of the report provides a list of tables and a list of figures.

28. The twenty-eighth part of the report provides a list of tables and a list of figures.

29. The twenty-ninth part of the report provides a list of tables and a list of figures.

30. The thirtieth part of the report provides a list of tables and a list of figures.

31. The thirty-first part of the report provides a list of tables and a list of figures.

F. W. Brownie,
Dir.Ex.by Mr. Steer.

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MR. CHAMBERS: I should have thought that that was going to be dealt with under this heading.

MR. STEER: As a matter of convenience, Mr. Brownie has prepared a statement combined as to the figures with regard to the annual anticipated load and daily peak demands as well. Now, if there is any reason why it should be put in separately, that can be done.

THE CHAIRMAN: I think not, Mr. Steer. I think it will fit in at the proper place.

.....

FRANK W. BROWNIE, having been first duly sworn, examined by Mr. Steer, testified as follows:-

Q You are assistant to the managing director of the Canadian Western Natural Gas Company, Mr. Brownie?

A Yes sir.

THE CHAIRMAN: You may have misunderstood me. I was suggesting to you that it would not be necessary to put in these figures now unless you wish to do so.

MR. STEER: I understood that we were proceeding to discuss now with regard to the future market demands, and Mr. Brownie will give his evidence on both questions.

Q You have prepared a statement, Mr. Brownie, as to the anticipated seasonal demands of your system over the period 1945 to 1970?

A That is correct.

Q And by seasonal demands you mean what?

A By seasonal demands I meant the demands of the Canadian Western system proper, as distinguished from the Imperial Refinery and the Alberta Nitrogen Company. That term was

F. W. Brownie,
Dir'l Ex.by Mr. Steer.

- 1335 -

used as a matter of convenience because it happened to be used in Mr. Ralph Davis' report.

Q And this is a statement which you have prepared?

A That is correct.

Q You will notice that there is a correction in pen and ink for the year 1960, which had been previously omitted. May I tender that?

THE CHAIRMAN: Exhibit 54.

DOCUMENT, ANTICIPATED SEASONAL
DEMANDS, MR. BROWNIE, MARKED AS
EXHIBIT 54.

Q MR. STEER: Now, if you will refer, Mr. Brownie, to Column 1, perhaps you will explain that column?

A Column 1 is the estimated future requirements from Turner Valley of the Canadian Western system proper, excluding the Imperial Refinery and the Alberta Nitrogen Company.

Q Those are the same figures as have previously been referred to in reports by Mr. Davies, Mr. Ralph Davis and Mr. Stanley Davies, and Mr. Stevens-Guille?

A That is correct.

Q And then will you explain the second column, and tell me how those percentage figures are arrived at?

A The second column consists of similar factors used for the purpose of estimating peak daily demand.

Q With respect to?

A With respect to the Canadian Western load proper.

Q Just tell us how that factor is arrived at?

A That factor was based on the assumption that as long as the characteristics of the gas load do not change, a factor determined from a peak load at one time can be applied to future annual requirements to determine future

F. W. Brownie,
Dir. Ex. by Mr. Steer.

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peak requirements.

Q That is to say, you get a factor which you apply to the yearly demand?

A That is correct.

Q And that will give you an approximation as to the peak load of that year?

A Yes.

Q And in the third column then you have applied your factor to the estimated seasonal load and you get your peak daily demand with respect to the Canadian Western's requirements?

A Yes.

Q And then in the next column you add to that seasonal load peak the demands of the Imperial Refinery, which I notice you have computed as 5 billion cubic feet throughout, and then you add for the years 1945 and 1946 the demands of the Alberta Nitrogen plant, and in the right hand column you get the total peak load that may be expected in any of those years?

A That is correct.

Q That is right. Now would you care to give us your comments on that whole set-up?

A Starting with Column 1, it might be useful to supply an outline of the method used in preparing that estimate, future market demands for the Canadian Western system, proper,; this estimate was made about a year ago, at which time it was assumed that the European war would be over at the end of 1944, and the Pacific war at the end of 1945. It was further assumed that 1946 and 1947 would be transition years leading up to more or less stable post-war conditions in 1948. That is apparent from the figures themselves.

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The load reaches a minimum in the year '48 and carries on at that figure for three years, and then starts to rise again. I will comment on that rise later.

A careful study was then made as to what the market might be in 1948. In other words, care was directed towards the estimate for the year 1948 on the assumption that other years could be fitted to it. In the year 1939 total gas produced and purchased exceeded gas produced and purchased in the year 1929 by less than 1%. Since variations in annual mean temperature gives a variation in annual gas demand, it is important in making comparisons to correct for this factor. If both years are corrected to the same temperature conditions, the 1939 figure was some 4% higher than the 1929 figure, or an increase of less than 4/10ths of 1% per annum. In spite of this small increase the number of customers increased by 5000 during that same period, 1929 to 1939, from 19,000 to 24,000. The total gas produced and purchased corrected to normal temperatures was about 6 million 5 hundred thousand Mcf. in 1939. If the same trend were followed as from 1929 to 1939, the 1948 figure would be around 6 million 7 hundred thousand Mcf. or about 3-1/3% higher to 1939. Without the occurrence of the war, this would not have seemed unreasonable, since the Company enjoyed a relatively high degree of market saturation. According to the 1941 Dominion census, 92% of all the homes in the City of Calgary were gas heated. However, the war increased gas requirements 60% over 1939 figures, and that 60% does not include the Imperial Refinery, which, of course, increases this load materially, or the Ammonia Plant.

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It was therefore necessary to make a study of the estimated 1944 demands and see what the effect the end of the war might have on the load. As a result of this study the 1948 load was set at 7,580,000 m.c.f.'s which is the figure shown in the tabulation, about 18 per cent above 1939 as compared with 6,700,000 m.c.f.'s on the basis of the long range trend. Rather than to go over the figures prepared a year ago, based on the estimated 1944 sales, it seemed preferable to present a reconciliation with the actual 1944 sales using the same general method. That is the figures were actually prepared of the 1944 sales at the end of the year and since the estimate was made early in the year 1944 the method used of making this reconciliation is to deduct from the 1944 figures - I should say that the 1944 figures of course refer to the actual figures corrected to normal temperature and show such sales as are considered to be temporary and due to wartime conditions and add the resulting figures for such new business as may be anticipated during 1944 and 1945. Prior to the war domestic sales were following a general downward trend and it was assumed that this was due in some measure to increased efficiency of domestic appliances and also to a large number of houses being insulated and perhaps to some extent due to smaller houses. This trend resulted in a reduction of sales for domestic customers from 199 m.c.f.'s per annum in 1935 to 189 m.c.f.'s per annum in 1939. Starting in 1941 as a result of new connections until 1944 it went up to 215 m.c.f.'s per annum.

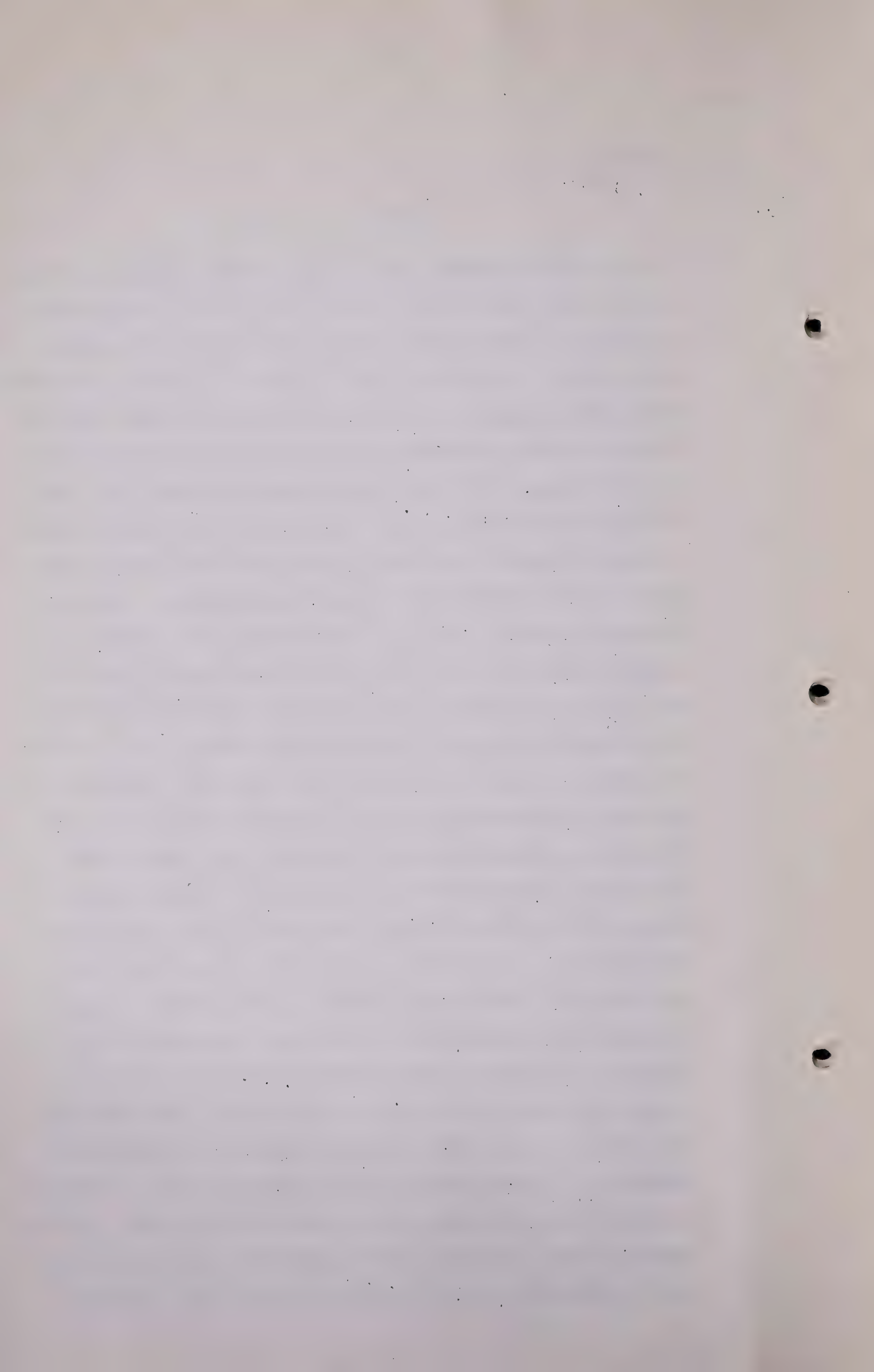
Q MR. BLANCHARD: What is that last year, in 1938?

A In 1944 it was 215 m.c.f.'s and this increase is accounted

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for by several factors, one of which was the increased market demand due to the war and also to less careful control of gas consumption. Some of these factors will of course continue to operate after the war and some will not. It is not anticipated however that the sales of gas in the post-war years will continue and if the pre-war downward trend be continued at even the 1939 figure, an arbitrary assumption is made that from 1944 to 1948 the 215 m.c.f.'s per annum will be required due to the lessening of the overcrowding and a more careful gas usage and to improvement in domestic appliances. This means therefore that 15 m.c.f.'s for approximately 24 thousand odd domestic customers is to be deducted from the 1944 sales in arriving at the post-war figures. During the years 1938 to 1944 some 3300 domestic customers were added. It is assumed that these will all be retained after the war. Similarly in the case of commercial sales the expected military and air force loads, annual sales per customer have jumped about 140 m.c.f.'s between 1939 and 1944 and it is arbitrarily assumed that 125 m.c.f.'s per customer of this increase will be wiped out. Direct military and air force sales have accounted for a very large portion of the wartime increase in commercial sales and an analysis has been made of the individual accounts in this connection and as a result it is estimated that 1,500,000 m.c.f.'s will be lost from the 1944 sales. In a similar manner in respect to industries several big loads which it must be assumed are of a temporary wartime nature have been removed and a careful study has been made of other industrial loads individually as a result of which 1,218,000 m.c.f.'s has been deducted from the 1944



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figures. After reducing the 1944 figures by this amount, the result is found to be lower than the estimated 1948 sales figure by 146 thousand m.c.f.

That is considered to be the allowance for business added during the years 1944 and 1948. It is assumed that new business actually taken on will exceed this amount but will be very much offset by certain loads which will be lost and for which ^{no} allowance has been made. This new business allowance should also be compared with the increase in gas purchased and produced on the basis of 200 thousand m.c.f.

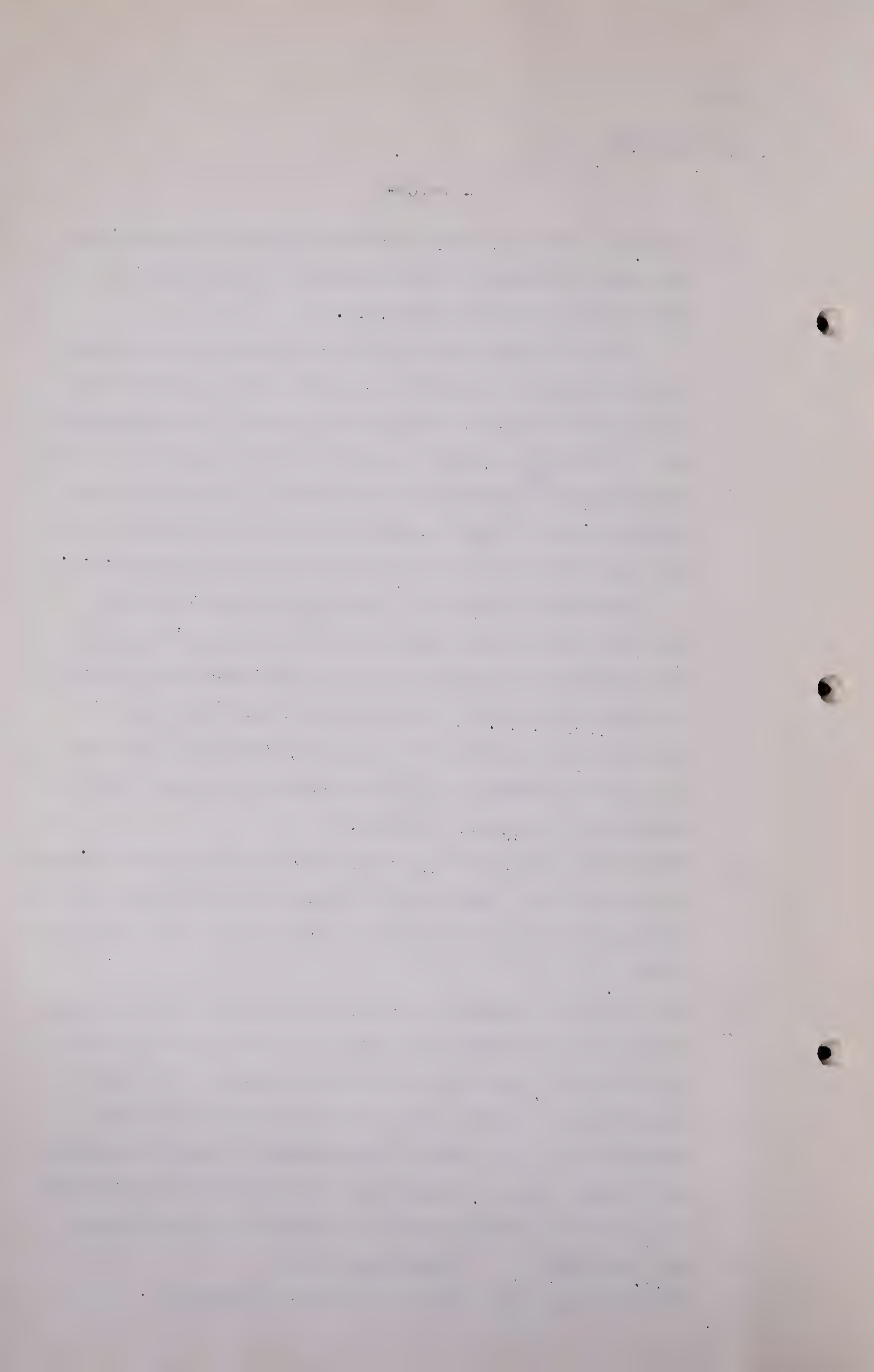
. . . between 1929 and 1939 during which time over 5000 customers were added. From the final gas sales' figures the estimated gas purchased from Turner Valley is computed at 7,580,000 m.c.f.'s. The years 1946 and 1947 were so estimated as the effect of a gradual transition from 1944 to 1948 and starting in 1951 an arbitrary one per cent per annum annual increase is added.

Q There was a point that my friend Mr. Blanchard asked Mr. Brownie to deal with and that was the Foremost and Bow Island reserves and the question of how much gas could be got from those reserves.

A The productive capacity of both the Foremost and Bow Island fields there is between 15 million and 20 million per day in each case, depending on the back pressure. The total availability of those two fields is not the sum of the availability of the two of them because of the restrictions due to pipe lines. I would say that the total availability from the seven fields would not exceed 25 million per day.

Q MR. BLANCHARD: How much per day?

A 25 million per day. That is generally speaking.



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CROSS-EXAMINATION BY MR. CHAMBERS.

Q Mr. Brownie, my recollection is that when Mr. Blanchard was examining Mr. Ralph Davis, that Mr. Davis indicated that the supply or the ability, put it that way, of the Bow Island and Foremost fields to supply Calgary was for a limited period at a time?

A Yes.

Q Did you hear that evidence?

A Yes. That is correct.

Q Would you please explain that in our language? Let me put it this way. When you talk about availability of Bow Island and Foremost being 25 million per day, can you do that every day all the year round?

A No, they can do that for short periods when the formation pressures around the well bore is equalized but as they produce and that pressure is pulled down the gas must come from more and more remote points in the formation and the ability to produce declines.

Q Are these two fields capable of supplying any given amount say all the year round to the Calgary market?

A Yes. They could supply some amount all the year round. I have not made an estimate of what it might be.

Q Can you give me any rough idea? I am not trying to get down to close figures but in comparison with this 25 million per day.

A Well I am just making a horseback guess, Mr. Chambers.

Q Yes.

A Perhaps half that amount.

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Q Now there was also something said the other day about the pipeline capacity, - I wonder for the purposes of the record if you would tell us the maximum pipeline capacity of your lines from Turner Valley to Calgary, first?

A I think the figure of 80 to 85 million has been used and I have no reason to change that figure. We have brought 80 million plus, just over 80 million through those two lines depending on the condition of those lines, if the condition of the lines was good I think it could be 85 million.

Q Now for the purposes of the record would you just explain the sizes of those lines and where they run?

A Well there is the old original 16"inch main line running South from Calgary to Bow Island. There is a small combination 6 inch and 8 inch line from Turner Valley, which joins the 16 inch line South of Okotoks; there is a 14 inch line from Turner Valley which joins the 16 inch near De Winton and there is the 10 inch line from Turner Valley which runs independently of the 16inch to the high pressure station South of the City

Q Now in Exhibit 54 when you speak of, the first column, of the annual seasonal load, is that just the Calgary load or does that include Lethbridge and the towns South?

A That is the entire business, that is Calgary and the other towns.

Q That is the entire system served by the Canadian Western
System?

A Including the Imperial Refinery, as you know, that is the Turner Valley demand of the entire system.

Q Yes. Now that is the point I was coming to, other than the Turner Valley supply as shown on Exhibit 54, do you get

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the supply for Lethbridge and any of these Southern towns from Bow Island and Foremost?

A Well the sales figures include the town of Brooks, which has an independent supply.

Q And which incidently is a very negligible amount compared with the total?

A It is small, yes. The only other source of supply which has not been used in recent years is the gas from Foremost.

Q So far as supplying the City of Lethbridge, do I understand that the gas from Turner Valley in the ordinary course goes to serve Lethbridge?

A That is correct.

Q And Lethbridge is only served from Bow Island or Foremost as, in peaks, in times of peak demand, is that correct?

A That is correct or in times --

MR. STEER: There is none from Bow Island.

Q MR. CHAMBERS: None from Bow Island, well Foremost?

A Yes.

Q Now I think I understood you to say that your Company's load from 1929 to 1939 increased by less than 1%?

A The actual gas produced and purchased in the interval between 1929 and 1939 increased less than 1%.

Q And then after it was corrected for temperatures and so on, it was something under 4%?

A Yes, something under 4%.

Q And that was during or over the period when the retail rates of your Company were going down, was it not?

A There were no rate reductions during that period.

Q Between 1929 and 1939?

A There was a rate reduction in 1939, the early part of 1939.

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Q I am just asking for information now, was there not an adjustment made in 1931?

MR. STANLEY DAVIES: No, we were unsuccessful.

Q MR. CHAMBERS: Well then during that period from 1929 to 1939 there were no up or down rates?

A That is correct.

Q Mr. Brownie, could you give me any breakdown say for 1944 or some years back, on the percentage of your annual consumption which might be allotted to domestic and commercial, or by the way, Mr. Brownie, when you speak of "Commercial" do you refer to all other than domestic or do you break that down between commercial and industrial?

A We have three classifications: Domestic, commercial and industrial.

Q I would like for the purposes of the record, if it is not too much trouble, to get a breakdown for those years 1939 to 1944 in that connection, and I would be quite content if Mr. Brownie would supply the information later?

A I have not got them all here, Mr. Chambers, I do not think: in 1929 to the closest 1%, - domestic 62%, commercial 17%, industrial 21%; in 1939 domestic 54%, commercial 30%, industrial 16%; In 1944 domestic 42%, commercial 36%, industrial 22%.

I might say in connection with the 1929 figures that there has been some reclassification of accounts since that date.

Q Now I wonder if you could tell us just briefly the dividing line, what you regard as the dividing line between the domestic and the commercial and the industrial classifications now for instance just to give you some idea of what I have in

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mind, a residential apartment house we will say, would you classify that under "domestic" or "commercial"?

A A large apartment would be commercial. The dividing line is not easily defined. A house which has just been converted into suites would probably remain I would think as domestic.

Q So long as it was not too large?

A Yes, but a large apartment building with thirty or forty apartments, built specifically for that purpose, would be commercial.

Q Yes. The heating of stores and so on of course is commercial?

A Commercial, yes.

Q Now what is the dividing line between commercial and industrial?

A Industrial is usually considered to be gas used for power or processing.

Q As distinguished --?

A As distinguished from gas used for building heating. Of course the two overlap to a certain extent.

Q Mr. Brownie, am I right in this, that the district of Calgary and Southern Alberta is probably one of the most difficult to serve, - I am leaving out now the actual cost of producing gas and I have in mind, it is very cold in the winter at times and in the summer you do not use much and then in the winter you have variations from day to day, what would you say as to that?

A We do not have a good load factor.

Q As a matter of fact it is about as varied as you could get anywhere, is it not?

A I have not compared them, Mr. Chambers.

Q But it is not good anyway?

A It is not good.

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Q And the poorer your load factor the more expensive operating conditions are, is that not right, taking them by and large?

A Other things being equal.

Q Yes, and I have in mind that when you have a poor load factor you have substantial extensions which are not always in use as when there is a good load factor?

A That is correct.

Q It is more or less very variable?

A That is correct.

MR. CHAMBERS: Now I do not propose to go into this at this time but I want to raise this point which may be of interest at sometime, to have it on the record and that is the retail rates that have been charged in Calgary say from 1921 down to the present time. I am not suggesting that Mr. Brownie should give these but all these things are inter-related I say and can we get those at sometime.

MR. STEER: We have no intention at the moment of bringing them in and at the moment I cannot see that they are relevant

MR. CHAMBERS: I am not pressing it at the moment but I am just raising a matter which may be of interest to your Honour. Thank you.

TO DR. BOOMER:

Q Mr. Brownie, in giving the percentages, of the industrial load, the commercial load and the domestic load, did you include the Imperial Oil Refinery and Alberta Nitrogen?

A No, they are not included in anything that I have said here.

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Frank W. Brownie

Cross-Ex. by Mr. Fenerty

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MR. FENERTY: . There are a couple of questions I would like to ask if I may now, At first I did not think I had any.

THE CHAIRMAN: Yes.

CROSS-EXAMINATION BY MR. FENERTY:

Q Mr. Brownie, I notice in this break-down of yours under the percentages of the various years that as between 1939 and 1944 there appears to have been an increase in the percentages of commercial and industrial uses, from 1939 to 1944 in both cases?

A That is right.

(Go to page 1348)

1. The first part of the paper is devoted to a discussion of the

main results of the paper, which are summarized in the following

2. The second part of the paper is devoted to a discussion of the

3. The third part of the paper is devoted to a discussion of the

4. The fourth part of the paper is devoted to a discussion of the

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9. The ninth part of the paper is devoted to a discussion of the

10. The tenth part of the paper is devoted to a discussion of the

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Exam. by Mr. Fenerty.

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. That is correct.

Q And my understanding is that there was a reduction in prices in 1939 I think ?

A Yes sir.

Q By the way, these figures I take it do not in any case include the items of Imperial Refinery and Alberta Nitrogen?

A No they did not include those items.

Q So that those increases are apart altogether from those large consumers. Are you in a position to tell me or have you noted any relationship between the rise and fall in consumptionas of industrial and commercial consumers. We have one here, but generally speaking?

A Well that rise, and those percentages coincided with a period of rate reduction. Unfortunately it also coincided with the war. It is rather difficult to evaluate the effect of the two factors.

Q Because you have that extraordinary factor of the war intervening?

A Yes.

Q Well now are you in a position to give me any comments on the relationship between the prices to the commercial and industrial users based upon earlier quantities. Where you do not have a war factor intervening?

A I have not made that study Mr. Fenerty. I can do that. I have not made a study of that for this purpose.

Q I wondered if you would make some enquiries and see if there is any significance there because my understanding is that while individual consumers may pay varying prices due to convenience, when it comes to commercial manufacturers it is a matter of dollars and cents. I was wondering if you could perhaps make some enquiries there and give us the results of it.

F. W. Brownie,
Exam. by Mr. Fenerty.
Exam. by Mr. McDonald.

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A Yes.

EXAMINED BY MR. McDONALD:

Q Mr. Brownie, in calculating these figures I understand you reached them through normal temperatures and pressures?

A What I referred to when I said corrected to normal temperatures was to correct figures in any year where the temperature may have been higher or lower than what might normally be expected. The correction was made to those figures to bring them back to normal atmospheric temperatures. That is over a long term average we have an average annual temperature in this city of, I think, 41 degrees. Now if in any year the temperature is 44 degrees that will have a material effect on our sales and on what we have to purchase. Therefore in comparing figures we, as a matter of routine, bring annual sales to an average figure, that is back to 41 degrees if I am correct in that figure.

DR. BOOMER: You are not referring to the temperature at which you measure the gas?

A No I am not. It is the atmospheric temperature which controls the consumption by customers.

MR. McDONALD: I misunderstood you there.

Q MR. FENERTY: I neglected to ask you this. These figures are, I take it, based on the present prices?

A Yes sir.

Q MR. CHAMBERS: I would like to refer Mr. Brownie again to Exhibit 54. The last column as I understand it is the total peak load. Is that right?

A That is correct.

Q Now am I right in this, that while for the years 1945, 1946 and 1947, your presently installed lines to Turner Valley would not enable you to take from Turner Valley the peak load?

F. W. Brownie,
Exam. by Mr. Fenerty.
Exam. by Mr. McDonald.

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A They could conceivably, Mr. Chambers, in 1947. In other years they could not.

Q But in 1947 you have a peak there of 85.7 and you think you might get by?

A Yes.

Q Would you explain what you mean by that. If the capacity of these lines are 85 as I understand it, how do you get 85.7 through them?

A Oh, the capacity of the pipe line, Mr. Chambers, cannot be determined that closely. I would not be prepared to say the capacity of those lines was 85 rather than 85.7.

Q Well with good luck you think probably you would get by in 1947?

A Yes.

Q Being that close?

A Yes.

Q Now then let me direct your attention to the years 1956 to 1970, both inclusive. By reason of your present installations you could not take care of your peaks from Turner Valley, assuming that the gas was there to be supplied?

A That is generally true, assuming also that we were restricted to 300 pounds inlet at the inlet of our pipe line.

Q Well let us take the last years where you get up to 90. You had a peak load daily of 90, 91, 92, 93, 94, 95, 96 and 97. From your knowledge of the operation of your system your Turner Valley lines would not be able to handle those peaks?

A They could not unless the Royalite people raised the pressures at our inlet lines, in that case we could.

Q When you say, raise the pressure, is that a matter of routine or what does that involve. Is it safe or unsafe. Would you enlarge on that?

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Exam. by Mr. Chambers.

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A Our lines are 14 inch and 10 inch lines and could carry higher pressures.

Q In other words if the compression put to it at the Turner Valley end were increased you suggest the lines would handle the peak then?

A Yes.

Q Have you any idea of whether additional equipment would need to be supplied and to what extent?

A Oh yes I think.

Q I mean, is it a comparatively inexpensive or expensive proposition. I am not holding you down to an exact proposition.

A No I think it might be a fairly expensive proposition, Mr. Chambers.

Q Going back to those percentages you gave me in 1929. I think you said domestic was 62% of the load and in 1939 it was 54% and in 1944 it was 42%. Now does that not indicate that there is less domestic gas being used in 1944 than there was in 1939 and less in 1939 than in 1929. I mean your load has not varied very much?

A There is more domestic gas being used in 1944 than in either 1929 or 1939.

Q I did not understand that your load had gone up that much.

A The load went up 60% during the war, Mr. Chambers.

DR. BOOMER: What is the highest peak that you have handled in Turner Valley?

A The highest peak we have had a supply from Turner Valley?

Q Yes.

A Just over 80 million.

Q What were your terminal pressures at your station south of the city?

A I do not know that off-hand, Dr. Boomer. I can find it out

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Exam. by Dr. Boomer.

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very easily.

Q Can the normal operating^{terminal} pressure on your line be dropped?

A It cannot be dropped too low. We have a minimum set by the Ammonia Plant. They require gas at some 70 or 80 pounds, I believe. I am not certain of that. It is also true that if we drop the terminal pressure from 100 pounds to, say 40 pounds, with inlet pressure of 300 pounds, you do not add very much to the capacity of this pipe line. I would think a matter of 4 or 5%.

Q Five million feet?

A It could be, yes.

Q One other question, I am rather curious about looking at the record here. I notice the Imperial Oil Refinery load doubles in 1942 and 1943 and jumped again from 1943 to 1944. Have you any explanation as to why the gas demand should range like that?

A I think there are other people much better qualified to answer that question than I am, Dr. Boomer. I understood it had something to do with the Iso-butane plant - with the high octane gasoline production.

Q So far as you know it has nothing to do with the relevant price of gas and oil, that is fuel oil. In that period your natural gas price has not been changed?

A No.

EXAMINED BY MR. HARVIE:

Q Mr. Brownie, have you given the figures of sales over the three years, 1929, 1939 and 1944?

A No I have not Mr. Harvie.

Q Could you just give that to us?

A 1929, total gas sales 6,613,579 Mcf.

Q That would be - that is 6 billion?

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Exam. by Mr. Harvie.

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A That is 6 billion odd cubic feet. 1939, 6,966,798 Mcf. 1944,
10,899,081 Mcf. Those are Mcf in each case.

Q MR. CHAMBERS: Is that last one to the Ammonia Plant?

A No these do not include the Nitrogen Plant or Refinery. They
are actual sales in each case. The unit is just as they are
measured to the customers' meters, which are in most cases
positive displacement meters.

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Q DR. BOOMER: That is an entirely different unit from the unit that has been used in all the reserve calculations?

MR. STANLEY DAVIES: That is right.

Q DR. BOOMER: You must bear that in mind in making the comparisons?

A Yes, but I am making a quotation of sales.

Q I am not criticizing you at all.

.....

CROSS-EXAMINATION BY MR. HARVIE:

Q Mr. Brownie, you have considerable of your market that you have given us in the South part of the Province, and could you provide the approximate amount of sales between what you might call the Calgary end of the system as against the Lethbridge, making a dividing line at possibly Okotoks?

A In 1944 Calgary accounted for 79.4% of the total sales.

Q That would leave 20.6% would it?

A For Lethbridge and the other towns.

Q And the percentage going to Lethbridge has it the same relation between the three classes of loads as in the Calgary, industrial, domestic and commercial?

A I do not have that information here, Mr. Harvie, and I do not recall having just what the situation was.

Q Now in Exhibit 54 you give the annual seasonal load for 1945 as 10 billion 640 million. At what pressures did that come in at, just for the record purposes, answering Dr. Boomer's question.

A That was at contract conditions, the Madison Company, 14 pounds absolute and I think 50 degrees. I am not certain

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Cr.Ex. by Mr. Harvie.

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of that.

Q Do you use the same basis of measurement both for your sales and your purchases?

A No.

Q Just explain that will you?

A The contract, the gas purchase contract is so arranged that we purchase a little less gas than we sell. That is a factor which is customary, as I understand it, in arranging gas purchase contracts to take care of line leakage and that sort of thing.

Q Well when you buy at the 14 pounds and at 50 degrees, how about your sales, what are they?

A They would average probably $13\frac{1}{4}$ pounds.

Q And the temperature?

A Well 50 or 60 degrees, whatever the temperature of the meter is.

Q And can you give us the approximate figures between the difference in volume between that purchased and sold?

A The gas purchased and produced is about 8% less than the gas sold.

Q Does that 8% include line losses?

A Yes.

Q It does?

A Yes.

Q DR. BOOMER: The gas purchased and produced is 8% less than the gas sold?

A Yes.

Q And does that include line losses?

A Yes. I am just comparing figures of gas purchased and produced with gas sold.

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Cr.Ex. by Mr. Harvie.
Cr.Ex. by Mr. Blanchard.

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Q MR. HARVIE: The line losses must be in addition to that?

MR. CHAMBERS: That is over and above line losses.

A WITNESS: I think the line loss is very small, as a matter of fact, Mr. Harvie.

Q MR. HARVIE: That is all, thanks.

THE CHAIRMAN: Mr. Blanchard?

.....

CROSS -EXAMINATION BY MR. BLANCHARD.

Q Mr. Brownie, have you the peak load figures for the last four years, year by year? 1940, 1941, 1942, or say the last five years?

A 1940, 55 million, 421 thousand. 1941, 70 million 187 thousand. Cubic feet in each case.

Q I beg your pardon?

A Cubic feet in each case.

Q Yes.

A 1942, 72 million 905 thousand cubic feet. 1943, 89 million, 785 thousand cubic feet. 1944, 85 million 063 thousand cubic feet.

Q And that includes the Imperial Refinery and the Nitrogen Plant?

A Yes.

Q All of those factors?

A Yes. I should have, perhaps, explained a convention which we use in respect to these peak loads. We actually refer to an hourly peak multiplied by 24. That is the basis on which all these peak load figures I have given are arrived at.

Q They seem to be somewhat lower on the average than your

F.W. Brownie,
Cr.Ex. by Mr. Blanchard.

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predictions for 1945, 1946 and 1947?

A Yes.

Q On the average a great deal lower?

A They are lower. We have not had peak load conditions during that time.

Q We had a pretty cold winter two winters ago did we not, a very severe winter, up in the forties and fifties for a month, somewhere around that?

A The answer to that, Mr. Blanchard, is that in 1936 we had a peak load of 71 million 949 thousand cubic feet, and our load was very very materially lower than it is now. If we had comparable conditions, that was on February 6th, 1936, presumably we could have peaks such as we estimated here.

Q I think the average annual load, that is throughout the winter months, for the last year, was something like 58 million cubic feet a day, something like that. I just want to get the difference between your peak and your ordinary load. Would that be approximately correct?

A I do not have that figure here, Mr. Blanchard.

Q All right, never mind. Well now, have you figures to show for how many days you require this peak load?

A I do not have figures of that nature here. It would be, that is a peak load which I would not expect to be of long duration.

Q Well, it is a fact that it lasts possibly two or three days or perhaps a week on one occasion, and then in another month you may have a similar condition. I wondered if you had any data on that?

A We have made studies along that line, Mr. Blanchard, but I do not have the figures here.

Q It seems to me perhaps important when you come to consider

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Cr.Ex. by Mr. Blanchard.

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the gas required from Turner Valley to meet these peak loads day after day, and to know what these wells from the gas cap may produce for perhaps a few days of the week at a certain capacity, or that that will be reduced. Now I was just wondering about your peak loads, what on the average is the length of time every day your peak load operates? I suppose that depends on the weather from time to time. Do you have any data along those lines?

A It could be - yes, we have made studies along that line but I do not have the data here.

Q Well perhaps we can have it later.

THE CHAIRMAN: Can you get that information Mr. Brownie?

A Yes. This peak that we are talking about is not a thing that will have any extended duration. This is the peak which will occur for perhaps one hour every two or three years. It is that sort of peak. It may be exceeded. We are basing this on 1936 data that had not perhaps the worst conditions that we might expect.

Q MR. BLANCHARD: When you give these figures, that is your estimate of the highest amount that you require at any one hour?

A That was my estimate based on 1936, Mr. Blanchard.

THE CHAIRMAN: You may be, though, a few thousand feet, within a few thousand cubic feet of your peak for possibly a week at a time?

A Yes, you might be, close to the peak, yes.

Q MR. BLANCHARD: What I am getting at is this, whether you have the data which would give us some idea of what capacity they must have to look after these peaks?

—

F. W. Brownie,
Cr.Ex. by Mr. Blanchard.

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A We have prepared what we call loaded duration curves similar to what Mr. Stevens-Guille refers to as load factor diagrams, and we can prepare data along that line for any year.

Q Well I think perhaps that is just what we want, although I dislike curves intensely. That ought to give us the information.

(Go to page 1360).

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Cr. Ex. by Mr. Blanchard.

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Q Now have you in your contract with industrial concerns any provision that you can cut off their supply in the case you have not enough gas to furnish the domestic market, to fill the domestic market.

A Speaking from memory, Mr. Blanchard, I believe they are such that the domestic market is protected.

Q The domestic market is protected?

A Yes.

Q In your contracts with industries then the domestic market has a priority?

A Yes.

Q In the event of peak load conditions being difficult or your being unable to fulfil the peak load demand?

A That is correct.

Q Now what can Bow Island and Foremost furnish for let us say a week at a time where you have extreme conditions.

A I should think they could furnish 20 million a day for a week, Mr. Blanchard.

Q That is the two of them?

A Yes.

Q They are only used for peak load requirements are they?

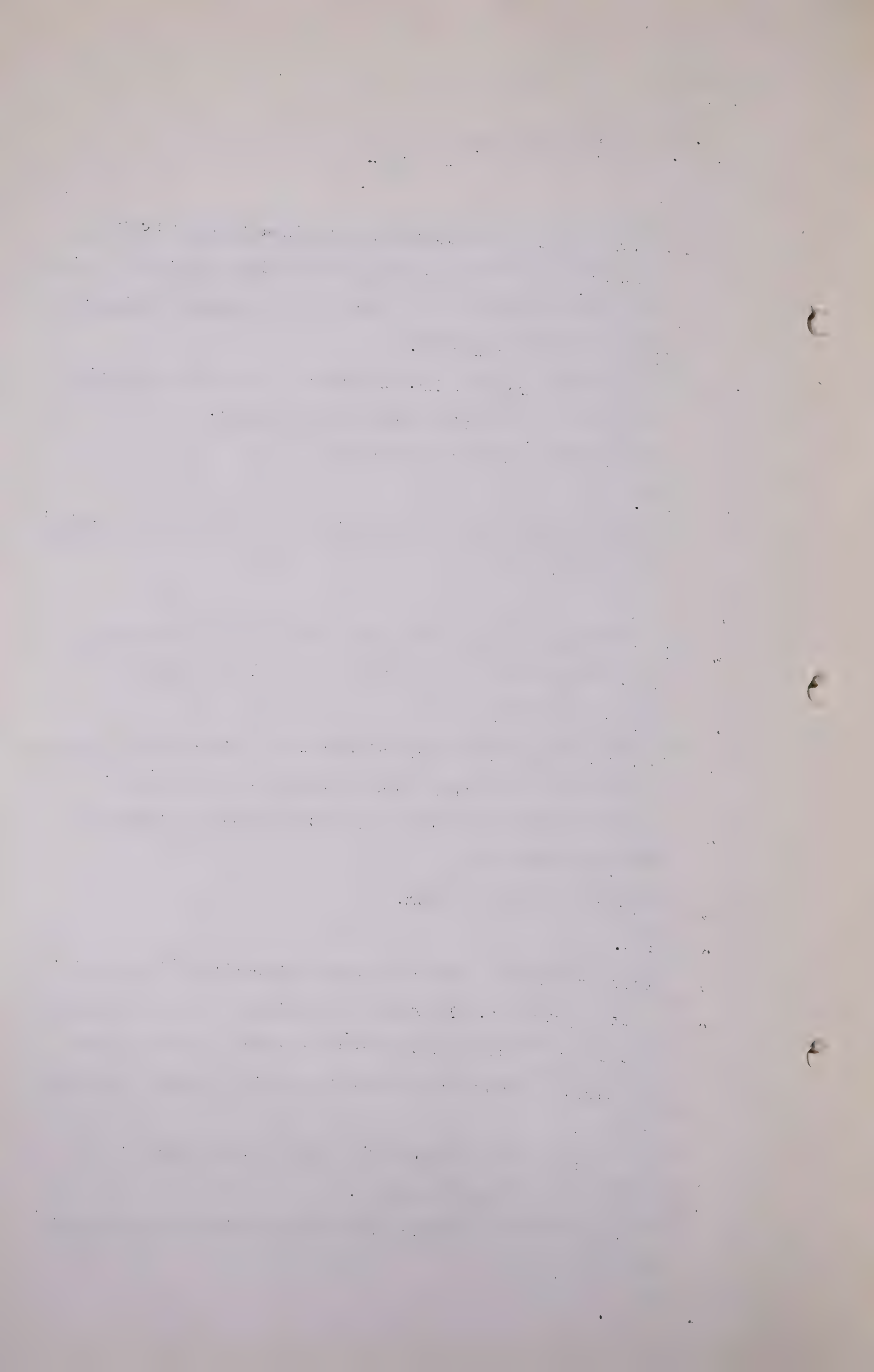
A That is correct. Peak load requirements and when necessary due to the fact that the main line may be opened up for repairs. In summer they supply a certain amount for that reason.

Q Or a break in the Turner Valley line, I suppose.

A If that should happen, yes.

Q But take it by and large, they are reserved for peak load purposes?

A Yes.



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Q And can furnish you think for a week at a time as much as 20 million feet a day?

A Yes, at the present time. That whole problem is one with many variables all of which can change with time and what those fields will do a number of years hence if they have been pulled down to any extent is another question.

Q Have you any data to show how often you have had to call on Bow Island and Foremost fields during the last 5 years.

A Yes, our records show.

Q And the quantity of gas you have taken from them?

A Yes.

Q You can furnish that?

A Yes.

Q Thank you very much. That is all I have to ask.

Q DR. BOOMER: I am still not clear on this question of the capacity of your line. These figures have 8.978 million mcf's in 1943 and 8.506 million m.c.f.'s in 1944, is that the whole system or is that what is brought into Calgary?

A That was the total field output, Turner Valley and Foremost.

Q That was the system peak?

A The system peak.

Q And not the local peak?

A Yes.

THE CHAIRMAN: Anything further?

Q MR. McDONALD: Yes. Arising out of Mr. Blanchard's questions, can you tell me Mr. Brownie the data of the degree days for say the four years, 1940, 1941, 1942, 1943 and 1944. That will be 5 years.

A I do not have that data with me, Mr. McDonald. I can supply that very readily. I think I have the average temperatures

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Cr. Ex. by Mr. McDonald.

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for those years.

Q Will you let us have the average temperatures and let us have a summary on some other occasion?

A Do you want the average temperature, Mr. McDonald, for the calendar year or for the year corresponding to our gas sales?

Q What is the period of your gas sales?

A Well our gas sales are based on continuous meter readings. The sales for 1944 actually include gas that was sold late in 1943 and does not include some gas that was sold late in 1944. We work out the temperatures for the sales year and for the calendar year.

Q Let us say from December 15th. to December 15th.

A Something like that, yes.

Q That would be all right.

A The weighted mean temperature for what year do you want?

Q 1940.

A For the year 1940, the billing year was 40.4 degrees; 1941, 43.0 degrees; 1942, 40.9 degrees; 1943, 41.9 degrees; and 1944, 44.8 degrees. The normal temperature was 41 degrees.

MR. DAVIES: 44 degrees.

A The 1944 figure was 44.8.

Q MR. HARVIE: Is that Calgary?

A Yes.

Q MR. BLANCHARD: That is the average temperature the year round, throughout the year?

A Yes.

Q MR. McDONALD: Have you data on record of the annual gas consumption of the comparative domestic installations, that is such as a five-roomed house, a seven-roomed house,

F. W. Brownie,
Cr. Ex. by Mr. McDonald.

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and a nine-roomed house?

A I do not have such data here, Mr. McDonald.

Q I did obtain from your office some time ago data to the effect that a five-roomed house would consume 226 m.c.f.'s per year; a seven-roomed house, 275 m.c.f.'s and a nine-roomed house 433 m.c.f.'s. Have you any

A I have no such figures here. I do not know the origin of those figures offhand.

Q You could obtain the information for me?

A Yes.

Q You can take it from the records of your company?

A Well it would have to be dug out and average the number of houses and their sizes.

Q That is all.

Q BY MR. CHAMBERS: There was one thing I would like to ask Mr. Brownie and that was on the question of improvements in appliances. I suppose you referred primarily to the heating equipment in homes, is that right? Is that what you had in mind?

A Well, all appliances are gradually being improved, Mr. Chambers. Even industrial appliances. New equipment is coming out all the time and it is more efficient.

Q In other words, by reason of improvements in cooking stoves, the domestic householder is operating the cook stove more economically, is that right, so far as the use of gas is concerned.

A I cannot answer that question specifically, Mr. Chambers. I do not know just the situation in regard to ranges.

Q You mentioned improvement in appliances?

A Yes.

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F. W. Brownie,
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Q Does that apply to cook stoves too?

A I do not know. They are improving everything.

Q Is it applicable to furnaces?

A Oh yes, very definitely. Improved burners are being installed.

Q And for power purposes as I understood you to say?

A Yes.

Q Then there is also I think you said an improvement in the construction of homes and improvement of homes already built.

A Yes.

Q I suppose your company has observed that from the study it has made from time to time over the last few years in the city of Calgary?

A Well, it is a matter of general knowledge of our people through contact with the fuel business, the gas business.

Q And as a matter of fact your company goes out of its way to advise people as to how they can save on gas consumption?

A Yes.

Q You know from experience and studies you have made that with installations in houses and things of that nature that in many cases the householder is paying less for his total gas bills than he did some years ago for the same house, improved. Is that not right?

A That was the trend before the war, Mr. Chambers.

Q And of course on account of war restrictions, it has put a damper on that for the time being?

A Yes.

THE CHAIRMAN: Thank you, Mr. Brownie. We will adjourn for a little while.

(At this stage there was a short adjournment.)

H. LeM. Stevens-Guille,
Dir. Ex. by Mr. Chambers.

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Mr. CHAMBERS:

I will call Mr. Stevens-Guille.

H. LeM. STEVENS-GUILLE, recalled,
examined by Mr. Chambers, testified as follows:

Q Mr. Stevens-Guille, you are still under oath?

A Yes sir.

Q And you have prepared and there has been distributed to the parties interested in the Hearing report No. M-4. This was prepared by you or under your supervision and direction?

A Yes sir.

Q What is this report?

A It is entitled "Present and Estimated Future Market Demand" and it covers the market, both the Canadian Western market and requirements of the smaller local markets in Turner Valley.

MR. CHAMBERS:

I tender that as an exhibit.

"PRESENT AND ESTIMATED FUTURE MARKET
DEMAND" REPORT NOW MARKED
EXHIBIT 55.

Q Mr. Stevens-Guille, will you read the report and make such comments or explanations as you go along as you see fit?

A Very well, sir. Turning past the index to page 1, Present and Estimated Future Market Demand. In order to estimate the "Economic Marketable Reserves" in Madison Report M-2 - and also of course in Report M-2A which was prepared after this report had been issued.

Q That is exhibit 47 you are referring to?

A I believe it is, yes. It was necessary to estimate first the future market demands for several reasons, of which the main are given below:

1. To determine the volume of gas cap withdrawals

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H. LeM. Stevens-Guille,
Dir. Ex. by Mr. Chambers.

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in winter required to supplement the volume of residue gas available from crude oil wells in order to meet the market.

2. To determine the volume of residue gas from crude oil wells in excess of summer market demands. To avoid flaring this gas, arrangements had to be made to store it in the limestone formation in Turner Valley and also a proportion of it in Bow Island.
3. To determine the throughput that would be handled by the various plants, which in turn influence the operating costs.

The market for this purpose was considered to be composed of the following distributors and users:

1. Canadian Western Natural Gas, Light, Heat & Power Company.
2. Alberta Nitrogen Company, for their Ammonia Plant in Calgary.
3. Imperial Oil Limited, for their Refinery in Calgary.
4. Valley Gas Company.
5. Valley Pipe Line Company, for engine fuel.
6. Royalite Oil Co. Ltd., for domestic fuel.
7. Madison Natural Gas Co. Ltd., for engine fuel.

That, I should point out, was put in in error because that is included in the deduction made for Plant fuel, but it was not noticed until after the figures had been used, and as it has but a small effect on the answer, it was not considered worth the time involved to re-compute the market and also the figures that have been based on this estimate of the market.

8. Gas & Oil Refineries Limited, for their refinery in Turner Valley.

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That was included here just as a matter of assumption.

Whether or not it is included in the final market is a point that no doubt the Board will decide and give direction on.

Details of the methods used to estimate the future requirements of each of the above listed consumers are given in the numbered paragraphs that follow and the volumes are summarized in Table 1.

1. Canadian Western Natural Gas, Light, Heat & Power Co. Ltd.

The C.W.N. Gas Co. total includes, in addition to all domestic users on their system, all commercial users except the two specifically mentioned, namely, the Ammonia Plant and Imperial Oil Refinery. These two consumers have been itemized separately because their consumptions represent a large portion of the basic load, therefore any major divergences in actual quantity of gas used, as compared with the estimates, will have appreciable effects on operating costs, rate of depletion of reserves and equipment requirements. The estimates for future demand by this system were obtained from the C.W.N. Gas Co. And those figures that we have used in column 1 of table 1, you will note, agree with the figures that Mr. Brownie submitted this morning.

2. Alberta Nitrogen Company.

The future demand of the Ammonia Plant was also obtained from the C.W.N. Gas Co.. Reference to Table 1, column 2, will show that it has been assumed that the Plant will operate at the 1944 rate of consumption during 1945; but only use half that amount in 1946, and will not be in operation after the latter year. That is also in accord with the submission already put in by Mr. Brownie for the Gas Company.

3. Imperial Oil Limited, Refinery.

It has been assumed that the fuel consumption of this

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H. LeM. Stevens-Guille,
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refinery will remain constant at the present level throughout the economic life of Turner Valley. That again is shown in column 3 and the figures used agree with those submitted by the Gas Company this morning.

4. Valley Gas Company.

This system serves widely scattered communities in Turner Valley, starting with Turner Valley town, close to the Madison Scrubbing Plant, and reaching as far South as Hartell and the Mercury School area. A syndicate takes delivery one mile South of Hartell of gas transported through the Valley Gas Company's main line, and carries it further South to supply Royalties and Longview. I think there is a minor correction to be made there. The point of delivery is no longer one mile South of Hartell. It is at Hartell itself.

(Go to page 1369)

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Longview is ten miles south of the Madison Scrubbing Plant. The estimated consumption of the combined system was compiled from information given by the Valley Company. Two projects now under way will, when completed, materially reduce the consumption of the system, it is anticipated. This has been reflected in the reduced volume shown for 1946 onwards. The programme referred to includes installing meters in those houses which are now on a flat rate, due to a previous shortage in supply of meters, and reconditioning of lines, which has also been held up by war conditions.

5. Valley Pipe Line Company

The consumption of this Company is mainly for fuel to the gas engines which drive their main line pumps. The pipeline runs have been decreasing for the last two years and it is expected that this trend will be more marked during the next few years. The fuel consumption is closely related to the quantity of oil pumped, therefore, it has been estimated as a decreasing quantity. From 1954 to 1960 it has been shown as a small but constant quantity as the movement of oil will by then be small. The small size of the total makes it immaterial in which year consumption ceases:

That of course is true of most of these remaining consumers. They are such a small proportion of the total that it does not have very much effect on our answers, whether we have made the estimate close or whether we have deviated from the figures quite widely.

6. Royalite Oil Company, Limited

Scrubbed gas is used by Royalite in its domestic circuits supplying offices, warehouses, machine shop,

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garage and staff residences.

7 Madison Natural Gas Company, Limited

After Madison's engine fuel had been included and the resulting market demand figures used, it was realized that, although the engine fuel is scrubbed, it should have been placed in the same category as the unscrubbed gas used for boiler fuel, and deducted from the gross residue gas available to the market in accordance with the usual procedure in the case of gasoline and scrubbing plants. As it amounts to only some three percent of the market, it is within the order of accuracy of estimating and therefore time was not spent in recalculating all the figures involved.

That explains the point that I made a few minutes ago and it has been included as a deduction in all our figures and is of course included in the deduction in all the current accounting procedure.

8 Gas and Oil Refineries Limited

The fuel used by this refinery, which is located in Turner Valley adjacent to Gas and Oil Products Gasoline Plant, is unscrubbed residue gas. This does not form part of the market today, but for the purpose of estimating the future market it was assumed that it would be included in the total market to be shared. The consumption was estimated on the basis of information given by that Company of their present consumption and by using an estimate of the throughput of the refinery, assuming that the crude oil handled would come from the wells now under their control. That is to say, in order to estimate the amount that the Refinery would process each year we took the estimated crude

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oil production from the wells known to be under the control of the organization operating the refinery and totalled that up to get an estimated throughput figure and then as that throughput figure was found to be declining each year, we declined the estimated fuel-oil figures in proportion.

It is arbitrarily shown that they will not use gas for fuel after 1950. The effect on the total market will be small, if this is not correct.

Conclusion

The future market has been estimated up to 1974, which is the last year that Turner Valley will deliver gas to the market, according to the conclusions reached in Madison Report M-2. "Economic Marketable Reserves".

Then if you will turn over to the Table "Estimated Market Requirements", you will note that the volumes are shown in M.C.F. per year.

Starting off on the left hand column, with the net sales of the Canadian Western, and those figures, as I have already pointed out, were obtained from the Canadian Western and agree with those which they have submitted this morning.

In column two, the consumption of the Alberta Nitrogen Company is shown and it has been estimated to be the same in 1945 and in 1944 except the figure has been rounded off for convenience and in 1946 it is shown as half the 1945 figure and from 1947 onward, following the same method of estimating as used by the Canadian Western, we have not included any consumption in the Nitrogen Plant.

Column three: The Imperial Refinery figures are given and are shown to be the same in 1945 and subsequent years as in 1944 except for rounding off. That also

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follows the Canadian Western estimates.

In column four we get the total of columns one, two and three.

And in column five we have the first of the users in Turner Valley, the Valley Gas Company, and you will note that in 1946 we have shown the marked reduction which has been referred to in the body of the report and we have shown that to continue at the same figure for the remaining years, the life of Turner Valley. The population of Turner Valley might go down and the number of employees would decrease to some slight extent with, first, drilling casing, then production of crude oil ceasing but rather than make a small change in these figures we have left it constant, as it is not very large in proportion to the total amount.

Column 6, the Valley Pipe Line: Consumption for engine fuel is shown and I have already explained how that estimate was made.

In column seven it is shown the Royalite domestic fuel consumption and that figure has again been left constant as it is a small proportion of the total.

In column eight we have the Madison Engine fuel which, has already explained, should have been omitted.

This gives in column nine the total volume of gas which we estimate will be scrubbed each year.

Q MR. CHAMBERS: You have not got the total for that column nine, the whole column?

A No, I have not got it in here.

due
Column ten is shrinkage to hydrogen sulphide and carbon dioxide extraction which occurs in the

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scrubbing plant, which added to column nine gives eleven the total raw gas requirements/scrubbing plant to deliver the amount of scrubbed gas estimated.

In column twelve we come to the estimated consumption of the G.O.P. Refinery, which may or may not be made part of the market to be shared. We have shown it here as part but of course it is a very simple matter from this Table to arrive at what the market would be without it.

And in column thirteen we have the total, including the B.O.P., for the years up to 1950 and from 1950 onward, as I have already explained, we arbitrarily assumed that the G.O.P. Refinery would no longer be in operation. As you can see the total, the G.O.P. are a very small proportion of the whole market, therefore, it is quite immaterial whether our estimated date is correct or not.

Then in column fourteen we have shown the cumulative market requirements which total according to these figures, 369 billion by 1974.

Now you will see at the bottom there is one error in the mathematical computation of the total but as it is very small and would only alter the figures in one of the reports being issued we have made no correction for it.

That, Mr. Chambers, I think covers anything which I have to say on it.

Q MR. CHAMBERS: Mr. Stevens-Guille, the gas supplied to the Royalite Domestic Consumers, as I understand it, that was the amount which was actually supplied calculated by the meter?

A Very definitely.

Q And the same with the Valley Pipe Line?

A All these figures are metered figures, metered to consumers,

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that is gas delivered to the consumers as shown by the meters.

Q In Exhibit 54, Mr. Brownie went down to 1970 and I note in column one of Table I, Exhibit 54, you carry on from 1971, through 1971, 1972, 1973 and 1974, you had those figures for those years, 1971 to 1974 from the Gas Company, did you?

A Actually, no, Mr. Chambers. What I did was to continue their process of adding 1% per year to the preceding year's volume to obtain this. I just brought it down to 1974 to agree with the figures and the dates reached in previous reports.

MR. CHAMBERS: That is all, unless you have something further to add.

THE WITNESS: No, I do not think there is anything further to add.

TO MR. STEER:

Q On page 2, Mr. Stevens-Guille, you state that your estimate of the future demand of the ammonia plant was obtained from the Canadian Western Company, you and Mr. Brownie talked about that one day and without purporting to have any authority from the Ammonia Plant to say what they were going to do, he gave you that as an estimate that he would use?

A That is correct.

THE CHAIRMAN: Mr. McDonald?

MR. MCDONALD: No question.

THE CHAIRMAN: Mr. Fenerty?

MR. FENERTY: No question.

THE CHAIRMAN: Mr. Blanchard?

MR. BLANCHARD: No question.

S. E. Slipper,
Dir. Exa. by Mr. Steer.

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MR. McDONALD: Mr. Steer mentioned about the Ammonia Plant. Is there any indication as to whether the Ammonia Plant is going to give evidence before the Board as to what their future requirements will be?

THE CHAIRMAN: We have no indication from them.

MR. CHAMBERS: In that regard you will recall Mr. Hendricks ^{here} was the first day or two and he was anxious to obtain and get from me a copy of the agenda two weeks ago.

MR. STEER: It has been reported to me that Mr. Ritchie Donald is coming here. Whether he will have anything to say to us I do not know.

THE CHAIRMAN: I am assuming he was to be here today, but whether he is going to come here or not I do not know. Now is there any other evidence to be led under Item 2. If not, then the third item, Gas Resources of the Province other than Turner Valley.

MR. STEER: I have asked Mr. Slipper to prepare a report on this matter and will call him now.

THE CHAIRMAN: Mr. Bailey, I wonder if you would be good enough to telephone Mr. McLaws and advise him that we have come to Item No. 3. He attended here and wished to be here when evidence was given on that point.

S. E. SLIPPER, having been duly sworn,
examined by Mr. Steer, testified:

Q What is your occupation Mr. Slipper?

A I am a Geologist.

Q And you are carrying on?

A Consulting Geologist.

Q As a consulting Geologist in Calgary?

A That is right.

Q And for how long have you been engaged in that practice?

S. E. Slipper,
Dir.Exam. by Mr. Steer.

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A I beg your pardon?

Q For how long have you been engaged in that practice?

A Since 1940.

Q And prior to that?

A I was Chief Geologist for the Canadian Western Natural Gas Company.

Q Back to what date?

A 1928.

Q And prior to that?

A Prior to that I was Petroleum Engineer for the Department of the Interior for the Dominion Government.

Q For what length of time?

A For five years.

Q What were your educational qualifications?

A I am Bachelor of Science in Geology.

Q From?

A Queen's University.

Q Queen's?

A Yes.

Q Have you made a study of the geology of the Province?

A Yes, I have.

Q And have you prepared a report on the gas resources of the Province?

A Yes, I have.

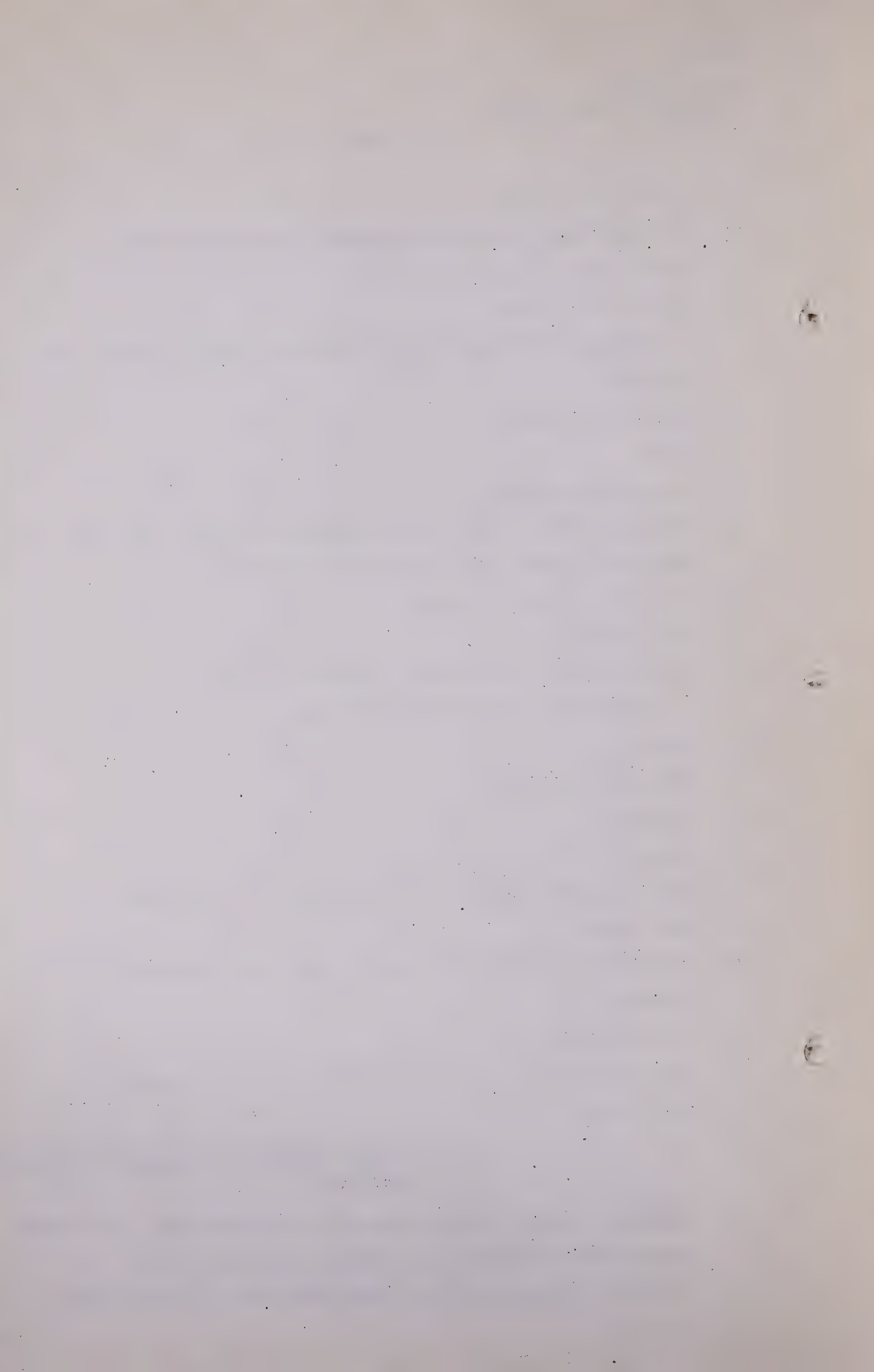
Q Have you a copy of it there that you can have marked?

A Yes, I have.

DOCUMENT ENTITLED "NATURAL GAS RESOURCES
OF THE PROVINCE OF ALBERTA" NOW MARKED
EXHIBIT 56.

Q Then Mr. Slipper you may proceed to read this into the record, making such comments as you choose as you go along.

A The title of the report is "Gas Resources of the Province of Alberta."



S. E. Slipper,
Dir. Exam. by Mr. Steer.

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GAS REGIONS AND HORIZONS OF THE PROVINCE

Alberta may be divided from West to East into (1) the Mountains, (2) The Foothills, (3) The Western Plains (Geologically, The Alberta Syncline), (4) The Eastern Plains (Geologically, The Alberta Homocline) and (5) The Pre Cambrian Shield in the Northeast. Of these regions the Foothills and Eastern Plains are of interest to us. The Western Plains, I. E. The Alberta Syncline, has been subject to comparatively little exploratory drilling but the few tests made have not been encouraging. Wildcats now drilling may alter the prospects. Since the conditions of accumulation are different in the Plains from those in the Foothills, the following discussions of gas prospects will be treated under

1 Plains Region Gas

11 Foothills Region Gas

1. Plains Region Gas

Throughout the sedimentary column of strata, gas accumulations are usually associated with certain "gassy horizons", and gas shows are found at almost any locality where these horizons are penetrated. However, certain anomalous conditions must affect the horizons in order to cause commercial gas pools. In the Foothills the necessary conditions are anticlines, domes, faults or other prominent structural deformations, but in the Plains Regions the immediately causal condition for a gas field is usually some change in texture of the gassy horizon, such as a sand lens, a wedge, an unconformity, etc., though with usually some assisting subdued structural deformation.

Gas Horizons

The Plains formations have been penetrated at a few localities down to the Pre Cambrian igneous rocks. In these tests the Cambrian, Ordovician and Silurian beds have been barren of



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gas. This does not prove that such is to be the result throughout the Plains. While there are several signs that the Devonian will yield gas, no commercial pools have been discovered in this system. Brief descriptions in ascending order, of the gassy horizons are given in the following paragraphs.

Carboniferous System - (Madison or Rundle Formation)

Gas has been found in the upper part of the Madison (Rundle) formation, or at the disconformity at its top. Carboniferous strata are found throughout the Eastern Plains as far North as township 32, and also occur as a belt on the West side extending North to Peace River. The carboniferous has not proved to be a prominent gas horizon. Gas fields occur in the sharp domes that encircle the Sweetgrass Hills in Township 1, where we find the one exception to the usual low dips of the Plains region. Gas in important flows also occurs in the Princess Field.

Jurassic System (Southern Alberta) - (Ellis & Fernie Formations)

Stray sand reservoirs of limited extent have been discovered in basal Ellis giving large initial gas flows, - e.g. Mayland Southern, Black Butte. Medium sized fields will be discovered from time to time.

I might mention that the Black Butte structure at the south-east margin of the Sweetgrass hills was drilled by the McColl Frontenac Oil Company and in drilling two wells for oil they discovered gas in very large quantities at three horizons. The gas flows are in the neighbourhood of 15 million feet and the closed pressures are about 1300 pounds in all the horizons. These wells are shut in and are very probably a potential reserve for the Calgary system. Just how much reserves are there cannot be definitely stated but we can presume a minimum of 25 billion cubic feet.

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Q MR. BLANCHARD: Just where is that Mr. Slipper?

A That is in Township 1, Range 8, West of the 4th Meridian.

Lower Cretaceous (Southern Alberta) - (May be part of Jurassic System)

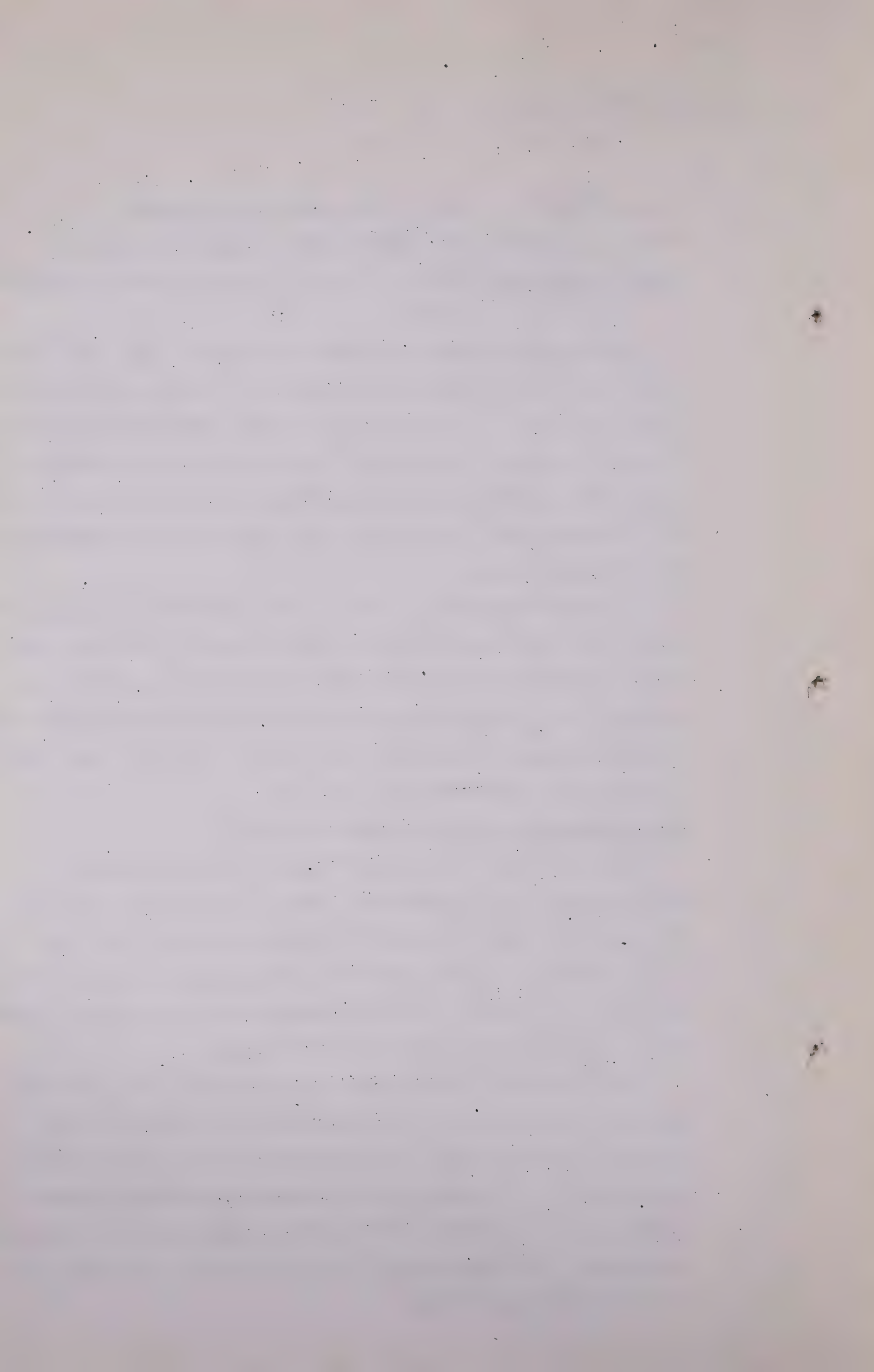
These gas horizons are named the Sunburst Sand, the Taber Sand, the Princess Sand, the Ribbon Sand, and are all more or less equivalent. The sands occur along a disconformity at the base of the Lower Cretaceous. They are limited sand bodies which have yielded important gas flows at Princess, Taber, etc. The accumulations will be important where found in proximity to existing pipe lines.

In this connection there are two wells which found gas at Taber while drilling for oil in what is called the Taber Sand. These gas wells may not have discovered a reserve of any importance but the wells themselves may possibly be important as auxiliary supplies along the pipe lines. Wells are only three or four miles from the pipe line.

Lower Cretaceous System (Central Alberta)

Gas is found in the locally known Wainwright sand, Vermilion Sand and Lloydminster Sand. It occurs at two horizons (1) the top of the Lower Cretaceous and (2) 130 feet below the top. A number of small gas pools have been and will continue to be found at these horizons in Central Alberta. The total amount of gas is probably quite large.

The Wainwright field has a few gas wells in it. It has not been explored for gas and possibly if it were more gas reserves would be found. The Vermilion field is an oil field, some gas has been found there and some gas in wells somewhat south of the Vermilion oil field are now supplying the town of Vermilion. This gas reserve could probably be developed to a greater extent than it is.



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- A There are other occurrences of Lower Cretaceous gas that have been found from time to time when drilling for oil. They have never been developed as gas fields.

Lower Cretaceous System (North, Central and Western Alberta)

Here is included the gassy horizons of the McMurray formation, the Peace River gas sands, the Pouce Coupe gas sands, and also the Grand Rapids formation. In the region North of the North Saskatchewan the Lower Cretaceous is of a different character than farther South, and over a large region includes two horizons which are known to contain large volumes of gas. The word "includes" should not be in there. These horizons may be referred to as the McMurray Sand and the Grand Rapids Sand. The McMurray Sand shows gas at Pelican Rapids, near Peace River and at Pouce Coupe.

The Grand Rapids sands give gas at Athabasca and Lesser Slave Lake.

The gas reserves in these horizons are believed to be very great.

Practically no well has been drilled in the region mentioned without obtaining very appreciable flows of gas, which, if they were in a locality near a market would be used commercially.

Upper Cretaceous System (North Alberta)

The Pelican Sand is a sheet sand occurring over a large region in North Alberta, and has been found as a gas pay at Lesser Slave Lake and along the Athabasca River. While probably not as large as those reserves in the Lower Cretaceous of the North, the Pelican gas

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resources are believed to be of considerable magnitude.

It should be mentioned that the Pelican gas field does not obtain its gas from the Pelican sand.

Q MR. STEER: Before you leave that page, Mr. Slipper, would you go back to the Lower Cretaceous?

A Yes.

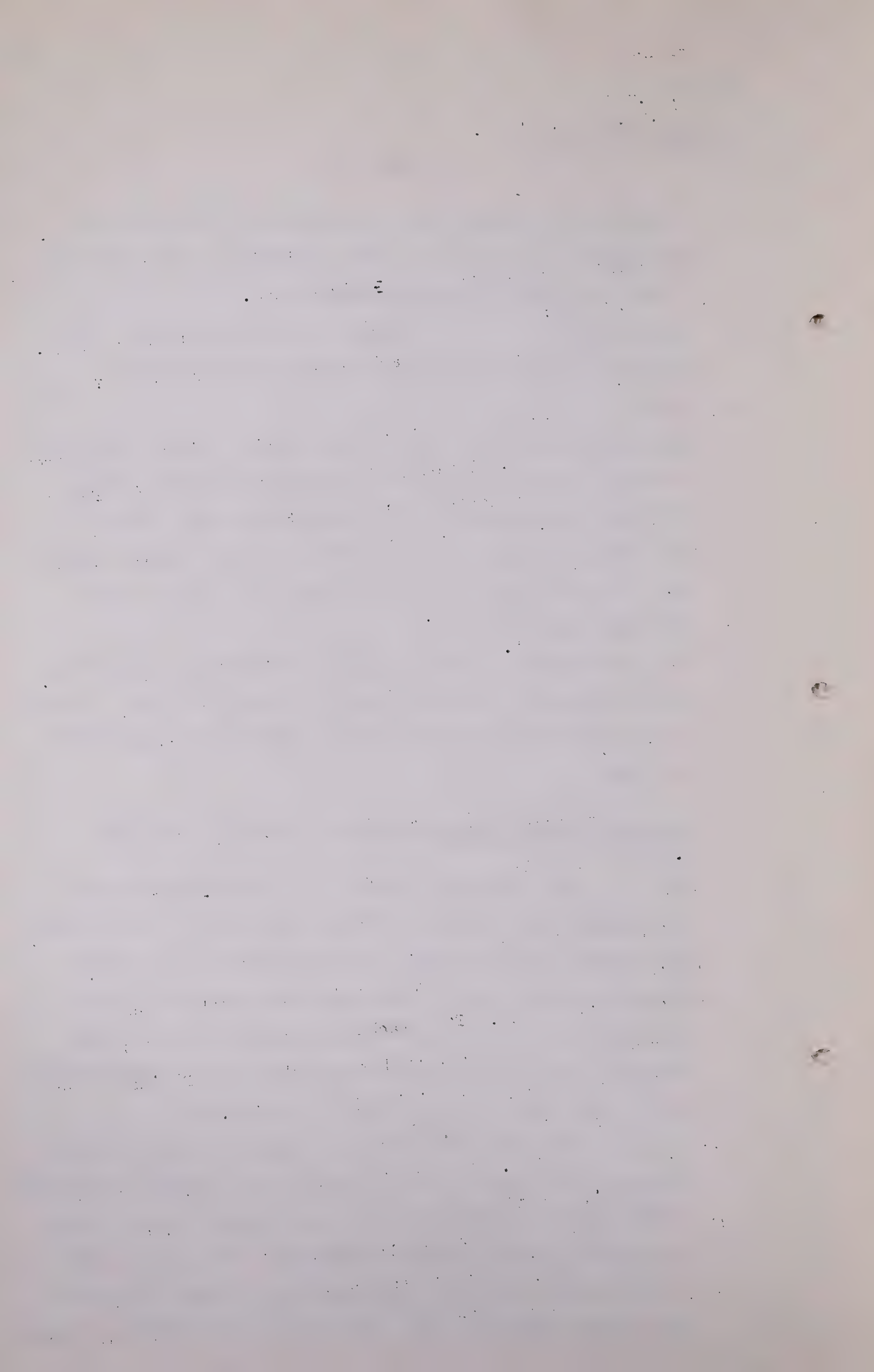
Q The copy which I have here reads a little differently from what you read. I wonder if you could check it? Page 3, "In the region North of the North Saskatchewan the Lower Cretaceous is of a different character than farther South," and the copy that I have reads "and over a large region includes two horizons".

A You are correct. I did not take up the first proposition. That correction I have mentioned is not to be made. I made a correction there while I was reading it and it is not to be made.

Upper Cretaceous System (Southern and Central Alberta)

1. The Blackleaf member of the lower Colorado has been developed more than any other gas horizon on the Plains. It includes the Bow Island, Viking and other gas fields. There are good prospects for developing Blackleaf gas in the Steepleville area. The Blackleaf sandy member of the Colorado extends over a very large part of the Plains region and the gas reserves are similarly extensive.

This is by far the most important at the present time, on the Plains. As I mentioned, the Viking, Bow Island and Foremost, practically all of the larger fields, obtain their gas from this Blackleaf horizon. The sand is not a continuous sand, but is in the form of large lenses and shore lines which have the gas usually collected in the thin



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edge of the wedges caused by the playing out of these lenses or shore lines into the Colorado shale. We believe that at Steveville where three wells, the Rainy Hills wells, the Anglo-Canadian 2 and the Anglo-Canadian 1, covering a linear distance of 15 miles, indicate a probable large Blackleaf gas reserve in that area. Now it is quite impossible from three wells to estimate the reserves that can be obtained, but if you will consider the extent of the country over which these wells are spread, and if you assume that the gas horizon is extensive over the same area, and you have no reason for presuming that it is not so, because you have made three tries and have got three successes, then you can assume that there is a gas reserve of considerable extent in the Blackleaf at Steveville. And that assumption, I think, can stand until somebody proves it different. The gas flows in that field were in the neighbourhood of from a million to ten million cubic feet. The pressures were around 900 pounds, I think, and the distance from the Bow Island end of the Calgary system to that area is approximately 50 miles, 57 miles.

2. The Medicine Hat sand in the upper part of the Colorado, while confined to the Medicine Hat area, is a sheet sand of considerable dimensions.

Since it is covered by a reserve for Medicine Hat it probably is of no particular interest in this connection, although there are extensions of the Medicine Hat sand to the Northeast which possibly could be considered as reserves which are not reserves necessarily for Medicine Hat.

3. The Milk River gassy horizon in the wedging out edge of the formation, has considerable areal extent. However,

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it is little more than a very gassy sandy shale and has commercial value only because it occurs at shallow depth, and is not of importance in relation to major gas systems. The gas at Brooks, Suffield, Alderson, etc., is derived from the Milk River Horizon.

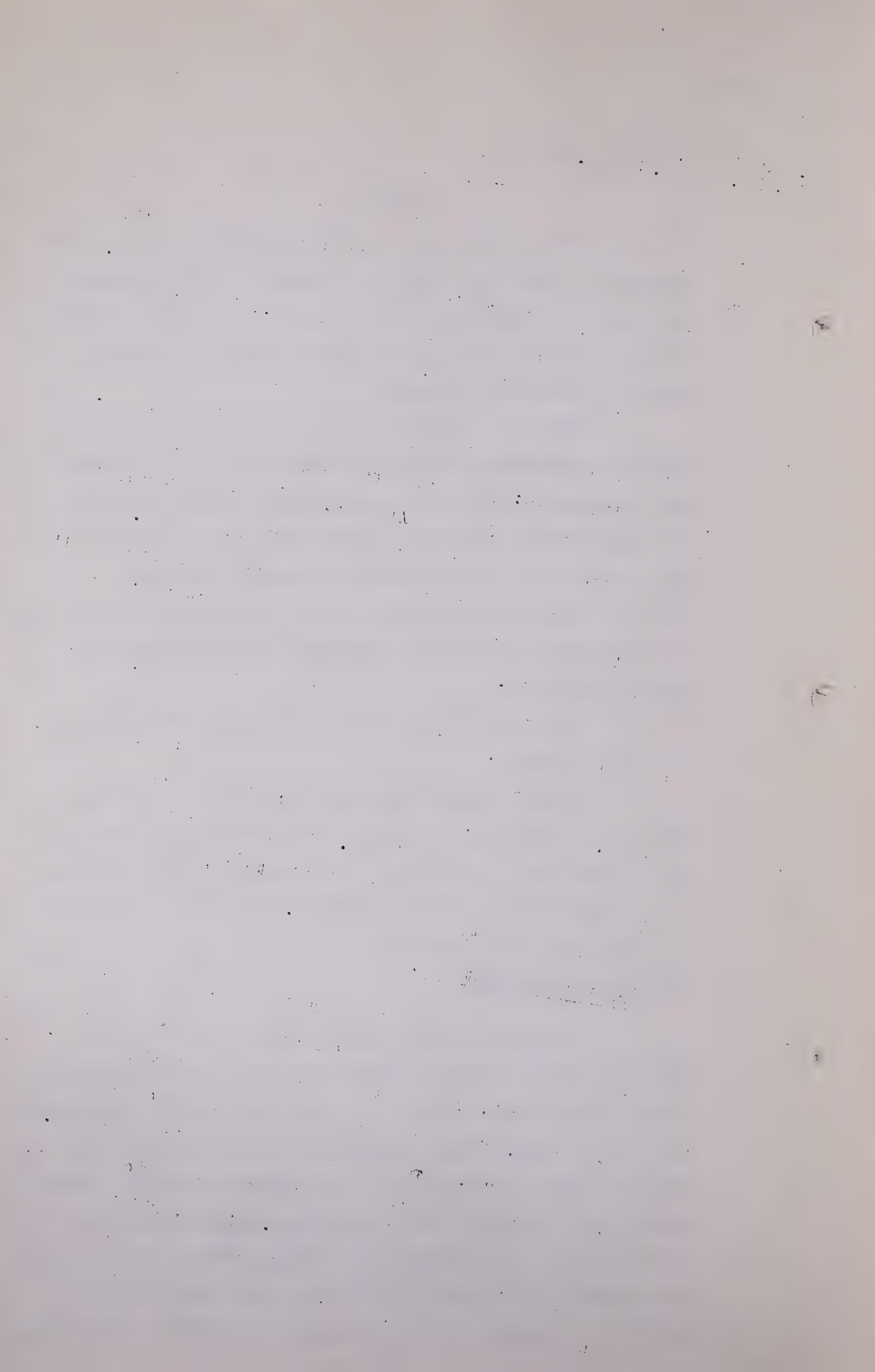
There are other minor gas sources on the Plains which are not now considered of any reserve significance. Some of these are: (1) Small gas flows from the Ribstone Creek formation of Central Alberta. (2) Gas in farmers' water wells from the Milk River in Southern Alberta. (3) Small flows from post Belly River formations such as that at Meeting Creek in Central Alberta and at Craigmile in Southern Alberta.

Section II deals with the Foothills Gas, Section II of the Report.

On the Plains "structure", that is: anticlines, domes, and faults, has a minor place in the accumulation of gas in commercial gas fields. In the Foothills, structure is all important and stratigraphic traps, while not ignored, are considered to be subordinate.

Foothills Structures.

In all the Rocky Mountain Foothills from far South in Montana to the Transverse Valley of the Athabasca on the North, Turner Valley has long been the only producing gas field, though a great amount of exploratory drilling has been done. Turner Valley is definitely unique. There is no other anticline with the same geological characters anywhere else in the Foothills. Those, which appeared to have been similar on surface examination, have proved to be unlike it at depth. If its geological character is considered



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to be essential for the accumulation of gas, then it would have to be admitted that the expectation for additional discoveries is not bright. However, none of us is convinced of this limitation and in fact the recent discovery at Jumping Pound has proven that a different type of structural high can be productive. Other types of anticlinal structures differing from either Turner Valley or Jumping Pound in that the anticlinal character on the surface at least, has been all but obliterated by faulting, may and probably will be drilled with success in some places. However, the optimism may be carried too far, since not every anticline or seismic high on the lime will contain gas. It is possible that most of them will not. Here we have the reason why it is so difficult to systematically discuss the gas prospects of the Foothills.

As an example: There is a very well defined anticline immediately West of Turner Valley, called the Highwood anticline, which is much higher structurally than Turner Valley, and answers all the requirements of the anticlinal theory, yet except for one or two minor gas accumulations, it contains only water in the limestone. The problem becomes one of finding some criteria which will enable us to differentiate between structures that contain all water, and structures that contain gas and oil.

A detailed analysis of the geological history of the structure and gas accumulation of Turner Valley may afford a method of arriving at basic principles. However, the history of Turner Valley, though simple in comparison to that of the other structures, is quite complex. It is not possible here to follow through with

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such a study but here is a brief synopsis.

1. Prior to the Rocky Mountain thrust, that is the Laramide Revolution, the Foothills area was occupied by large elongated domes and basins of low relief. These contained fluids in the Madison porous horizon according to the anticlinal theory, that is, gas and oil accumulated in the upper parts of the domes, while water remained on the lower flanks and in the basins, or synclines. These structures are called the primary structures and the oil and gas pools the primary accumulations. The term is my own. It is not a standard term.

2. The Laramide revolution caused a great deformation and destruction of the primary anticlines and synclines, and produced the present pattern of secondary anticlines and synclines.

3. The present secondary anticlines do or do not contain gas and oil according to whether they were, or were not, formed from the upper parts of the primary domes. For example: Turner Valley is a secondary structure, deformed within the oil and gas zone of a primary dome, while the Highwood is a secondary anticline rising out of a primary basin or flank containing water.

4. During the folding of the secondary anticlines, an induced secondary permeability of the Porous horizon was formed by tensional strains along the crests and down the North and South plunges of the anticline. This caused a release of pressure and there were secondary accumulations of gas and oil along the tensional belts. Tensional strains were also caused along the West flank

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which have opened up the pore permeability in certain zones.

Such tension belts determine the location of commercial gas fields on the secondary structures.

5. Some of the secondary folds, particularly those in the western foothills, were so deeply eroded that there has been extensive leakage of gas and oil from the crests and they have become unimportant as gas fields.

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Madison or Rundle outside Turner Valley.

By applying the theory of primary and secondary anticlines with secondary accumulation, there is reason to believe that there should be several gas and oil containing structures in the Foothills. Unfortunately, nearly all these anticlines are faulted off on the East side and frequently the Madison crest is vertically below an unknown location westward of the surface anticlinal crest. There is said to be some promise that seismic surveys may be successful in locating Madison highs. If so, the intricate surface structures with their misdirection of exploratory effort may be ignored in future prospecting.

I shall not indicate specific areas of gas reserves, but it is possible that there are two or three major fields in the Foothills Madison in addition to Turner Valley. In this connection, of course, we should refer to the Jumping Pound discovery. It has developed a structure that is probably not the same kind of structure as Turner Valley. It has only the one well. It is capable of producing a large amount of gas at a high pressure but apart from that mere statement we cannot go any further than to express opinions. It is my opinion that the Jumping Pound is one of a series of over-thrust fault blocks extending from Jumping Pound northward to some extent and also continuing southward as far as, or nearly as far as Turner Valley. Now these thrust blocks are going to be hard to find. They are going to be expensive. But in my opinion there is as much or more gas in these blocks as there is contained or has been contained in Turner Valley. It should be noted that Jumping Pound is not over 25 miles from Calgary and if, as I suggest, that

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large reserve will be developed in that region it could easily add a new era of gas production to the Calgary system.

Madison Turner Valley

Turner Valley has reached a stage of almost complete development. There are possible extensions on the Northwest trend. And while I am saying this I just mean the extensions that are now shown on that map of Turner Valley. However such extensions may not add materially to the estimated reserves. Continued exploration of the East flank below the over-thrust may result in additions to the estimate.

Gas in the Devonian

We know that there are at least two porous gassy horizons in the Devonian of the Foothills. Where these have been penetrated near the summits of the anticlines, water in large volume has been encountered, together with good flows of gas. Over most of the Foothills the Devonian lies at great depth, but on the Moose Dome and along the Clearwater belt of anticlines, it is reasonably shallow. It is expected that gas reserves will be discovered in the Devonian of the Foothills. As the gas occurrences of the Moose Dome are fairly familiar to everyone. Development has gone along on the Moose Dome for a number of years but not a great deal of result insofar as gas is concerned have been obtained. However along the Clearwater River and extending west for 30 miles are a series of anticlines which as a matter of fact look almost like what you could picture Turner Valley to be if all the formations down to the Devonian had been taken off the surface, leaving just the Devonian anticline or set of anticlines. The Gas Company jointly with others drilled a



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diamond drill hole on the Southernmost of these anticlines just as a prospecting effort in order to see whether there was any gas in the Devonian. Gas horizons were encountered, one at 900 feet and one at 2300 feet. There were other gas horizons but they were the two important ones. The first gas horizon was not large, probably half a million feet of gas but it contained a very rich amount of gasoline. The gasoline would drip out of the pipeline while gas was flowing through it. The lower gas was a gas that had a similar heating value and similar composition to that of Turner Valley. There was about half a million cubic feet open flow but there was a great deal of water with the gas and it was not easy to measure. We estimated the flow as from half a million to a million feet out of an inch casing. So while nothing clearly can be said about the definite gas reserves of these anticlines they do suggest an important prospecting possibility.

Reserves in the Cambro-Ordovician

The same remarks may be made of the Cambro-Ordovician as those applied above to the Devonian. Gassy horizons have been encountered, but production has not been discovered. The same well I am speaking of got gas still lower down from beds below the Devonian.

- Q MR. BLANCHARD: May I ask a question? Where are these wells that are drilled in the Clearwater and Cambro-Ordovician?
- A They are shown in Township 34 in the Foothills region.
- Q Oh yes, they are marked with a circle.
- A Yes, they are marked 1 and 2.
- Q Oh yes.
- A By the way, the formations that are called Cambro-Ordovician are given that name without knowing what they really are.

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They are somewhat below the Devonian.

Gas Reserves and the Calgary System

The total reserves of Turner Valley may be sufficient to supply Calgary for say 20 years. The problem, however, is not caused by a lack of proven reserves, but by a complex of difficulties peculiar to Turner Valley that occur in any endeavour to assure a balance in the maximum rate of supply to the maximum rate of demand for fuel gas over a reasonable number of years. When the decline in delivery capacity of Turner Valley makes it necessary to seek a supply elsewhere, the following sources of gas may be considered.

1. The addition of supplies from the Southern Alberta Plains Reserves.

(a) by projecting the Foremost terminus of the gas line thirty miles South to known boundary gas fields in the Blackleaf, Sunburst and Ellis horizons. These fields could be developed to add materially to the capacity of the system.

I previously have mentioned the Blackleaf structure in this area A. There is also another gas prospect on what is called the Mayland Southern structure. One well was drilled and got quite a lot of gas and is now abandoned. The gas was in commercial quantities. It is just possible that the discoveries at Black Butte at the Mayland Southern well are not necessarily controlled entirely by structures, but it may be that they have been accumulated in sand lens. There is some suggestion of this in the samples obtained from the wells and if such is the case then it is quite probable or is quite possible that the reserves are larger than the 25 billion I suggested for Black Butte and they also may extend

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from Black Butte over to the Alberta Southern Prospect or Southern wells.

(b) by extending the Burdett end of the line North for 56 miles to the Steveville area to tap the known supplies there.

In this connection, I have already mentioned the Blackleaf possibilities in the Steveville area and in addition to this, the Standard of California and others have found very considerable gas in horizons below the Blackleaf. That is in the Ellis, Princess sand and even in the limestone. I understood when I prepared this report that the Standard of California was going to present information on those reserves and I have not dealt with them in any detail here.

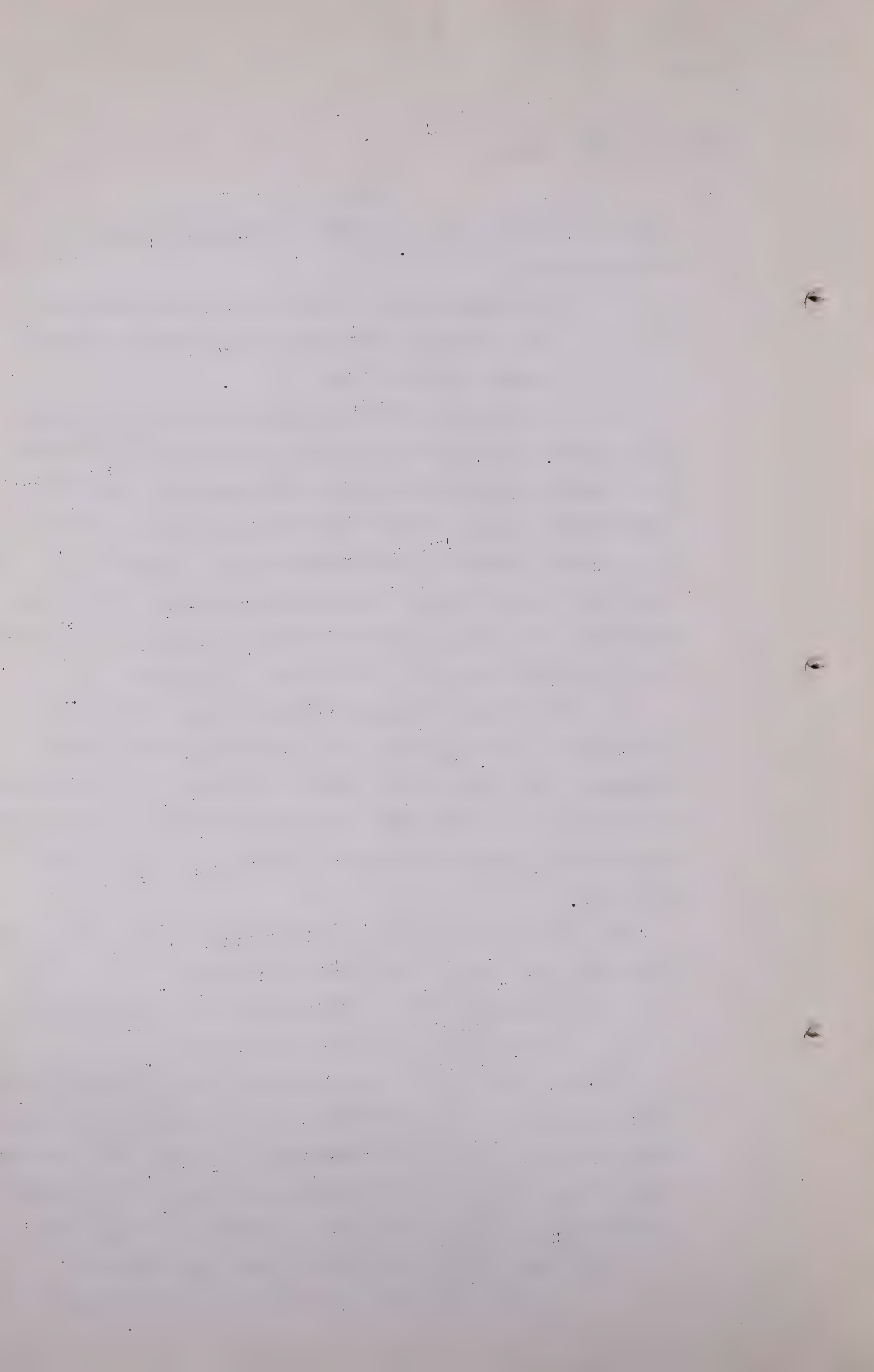
2. The adding of supplies from Foothills structures immediately West of Calgary, such as Jumping Pound, Moose Mountain, etc. This would require a 25 mile line to Jumping Pound and say a 40 mile line to Moose Mountain. No doubt there will be large supplies available for such a project within a few years.

3. The adding of very large supplies through a pipe line connecting the Calgary and Edmonton systems.

(a) Large potential supplies in Central Alberta would be accessible to the Calgary system.

In this connection of course we know that there are very large reserves already developed in the Viking-Kinsella field which are now supplying the Edmonton Gas System. The reserves in those two fields are 600 billion cubic feet. This amount could be added to very materially by further development.

(b) Some probable Foothills fields Northwest of Calgary would then be accessible to the Calgary



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System. By this I refer to the Clearwater set of anticlines already mentioned and also to the Brazeau structure where the Home Oil Company some time ago obtained an appreciable commercial flow of gas in a wild cat well drilled for oil.

It may then be concluded that there is no cause for alarm that the Calgary system will be without sufficient gas to meet demands as Turner Valley declines.

Now it may be said that there are no actual figures of reserves contained in what I have given you and that is quite true. But as a matter of fact it is seldom that anyone develops a gas field for any length of time before it is required, because it ties up capital for an unknown time in the future and it also usually places an intolerable burden of rental charges on the company that is trying to protect the acreage. So that it would not be likely in any case that we would have developed reserve figures to submit to you,

THE CHAIRMAN:

We will adjourn until 9.30.

(At this stage the hearing was adjourned until 9.30 A.M.

4th April, 1944.)

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